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TIDAL AND LUNAR DATA FOR POINT MUGU, SAN NICOLAS ISLAND, AND TH--ETC(U)
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TIDAL AND LUNAR DATA FOR
POINT MUGU, SAN NICOLAS ISLAND,
AND THE BARKING SANDS AREA
DURING 1978

15 December 1977

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PACIFIC MISSILE TEST CENTER

Point Mugu, California 93042

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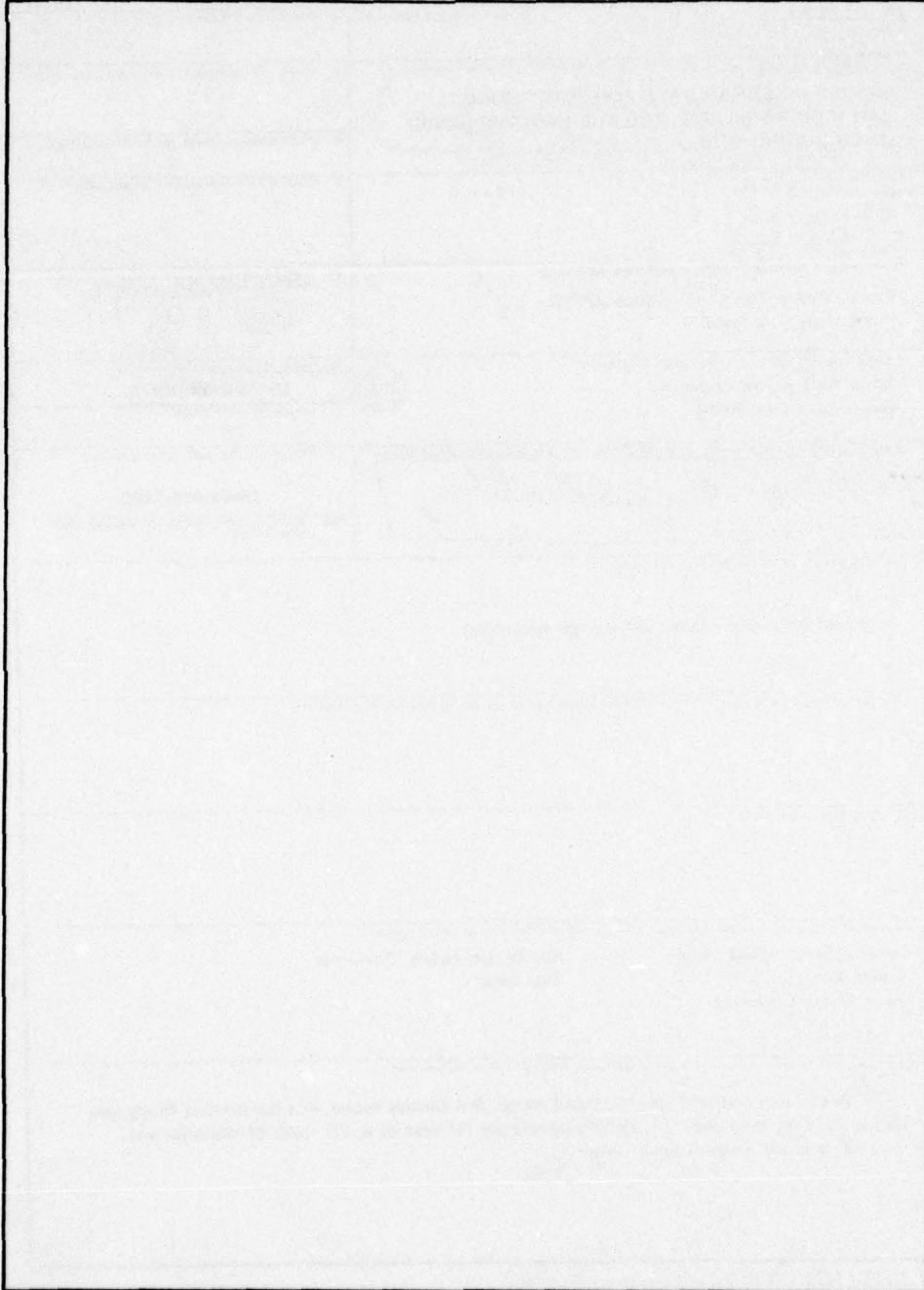
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INTRODUCTION

This publication combines into a single source all tidal and lunar data for operational locations of the Pacific Missile Range for use in Calendar Year 1978.

The data presentations are in two main divisions: one for Point Mugu and San Nicolas Island, and the other for the Barking Sands area. Within each division, the times of moonrise and moonset and tidal data are given. An appendix provides information regarding lunar phases. Since all such data change from year to year, this publication will be reissued annually.

Sunrise-sunset times for these locations, and associated solar data which do not change significantly from year to year, are issued as a single, permanent publication. Further information regarding any of these data may be obtained from the Geophysics Division of the Range Operations Department.

DATA SOURCE AND TIME REFERENCES

The data given here have been prepared from information contained in Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1978.*

For Point Mugu and San Nicolas Island, all times listed are Pacific Standard Time (PST); add eight hours to obtain Greenwich Mean Time (GMT or Z).**

For the Barking Sands area, all times listed are Alaska-Hawaii Standard Time (AHST); add 10 hours to obtain GMT. Daylight Savings Time is not observed in Hawaii.

*National Ocean Survey. Tide Tables for the West Coast of North and South America Including the Hawaiian Islands, 1978. Washington, D.C., GPO, 1977.

**When Daylight Saving Time (PDT) is in effect, 1 hour is to be added to the times given. In 1978, Pacific Daylight Time is scheduled to commence at 0200 PST on Sunday, 30 April (add 1 hour), and to end at 0200 PDT on Sunday, 29 October (subtract 1 hour).

TIDAL DATA

The ranges of tidal heights that may be expected at Point Mugu and San Nicolas Island are shown in table 1. The range of heights for the primary harbor in the Barking Sands area, Port Allen, is shown in table 2. The times and heights of high and low tides for 1978 at Point Mugu are given in the even-numbered tables 4 through 26, and at San Nicolas Island in the odd-numbered tables 5 through 27. Similar tide data for Port Allen are given in tables 29 through 40.

Table 1. Tidal Ranges for Point Mugu and San Nicolas Island

Tidal Levels	Point Mugu	San Nicolas Island
	Height (Feet)	Height (Feet)
Extreme high water	7.3	6.7
Mean higher high water	5.3	4.9
Mean high water	4.5	4.1
Mean tide level*	2.7	2.5
Mean low water	0.9	0.8
Mean lower low water	0.0	0.0
Extreme low water	-2.0	-1.8

*The mean tide level is also called mean sea level.

Table 2. Tidal Ranges for Port Allen

Tidal Levels	Height (Feet)
Extreme high water	2.6
Mean higher high water	1.6
Mean high water	1.2
Mean tide level*	0.7
Mean low water	0.2
Mean lower low water	0.0
Extreme low water	-0.4

*The mean tide level is also called mean sea level.

Tidal graphs prepared from the Point Mugu data are presented in figures 1 through 12, and graphs prepared from the Port Allen tables are presented in figures 13 through 24. (Because of their close similarity to the Point Mugu graphs, graphical presentations of the San Nicolas Island data are not included in this publication.)

These tables list the times and heights of high and low tide for each month of the year and chronologically through each day. The heights are all measured from mean lower low water (see tables 1 and 2) and are values for a sea unaffected by wind waves or swell. The height and character of the sea surface are influenced by factors other than the predictable positions of the moon and sun, and is thus likely to be higher or lower than computed values may indicate.

LUNAR DATA

Times of moonrise and moonset for the Point Mugu-San Nicolas Island area in 1978 are given in table 3, and for the Barking Sands area in table 28, preceding the tidal data for the respective stations. Information regarding the phases of the moon in 1978 will be found in the appendix.

Table 3. Moonrise and Moonset, Point Mugu, California, 1978

Date	January		February		March		April		May		June		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	2356	1115	0052	1155	---	1042	0135	1228	0151	1332	0220	1525	1
2	---	1152	0156	1245	0050	1134	0224	1332	0229	1433	0256	1622	2
3	0057	1231	0259	1341	0150	1231	0308	1436	0305	1533	0334	1717	3
4	0201	1314	0400	1442	0247	1332	0350	1539	0342	1633	0414	1811	4
5	0306	1402	0458	1547	0339	1437	0428	1641	0418	1732	0457	1903	5
6	0412	1457	0550	1655	0428	1543	0506	1743	0455	1829	0542	1952	6
7	0517	1558	0638	1803	0512	1649	0543	1843	0534	1924	0630	2038	7
8	0618	1704	0721	1909	0554	1753	0620	1942	0616	2018	0720	2120	8
9	0714	1812	0802	2013	0633	1856	0659	2039	0700	2108	0812	2159	9
10	0804	1920	0839	2115	0710	1958	0739	2133	0747	2156	0905	2236	10
11	0849	2027	0916	2215	0747	2057	0822	2226	0836	2240	0958	2311	11
12	0930	2130	0953	2312	0825	2155	0907	2315	0926	2321	1053	2345	12
13	1007	2232	1030	---	0904	2251	0954	---	1018	---	1149	---	13
14	1043	2331	1109	0008	0945	2344	1044	0001	1112	0000	1246	0019	14
15	1119	---	1150	0102	1028	---	1135	0044	1207	0036	1345	0054	15
16	1154	0028	1234	0153	1114	0035	1228	0124	1303	0111	1448	0131	16
17	1232	0123	1320	0242	1202	0122	1323	0202	1400	0146	1552	0212	17
18	1311	0218	1410	0329	1252	0207	1419	0238	1501	0221	1658	0257	18
19	1353	0310	1502	0413	1345	0249	1517	0314	1603	0256	1804	0349	19
20	1438	0400	1555	0454	1440	0329	1617	0349	1707	0337	1907	0447	20
21	1526	0448	1650	0533	1536	0406	1719	0426	1813	0421	2006	0550	21
22	1616	0533	1747	0609	1633	0442	1822	0505	1920	0511	2059	0657	22
23	1709	0616	1844	0645	1732	0518	1927	0547	2024	0605	2147	0805	23
24	1803	0656	1943	0720	1833	0554	2032	0633	2124	0705	2230	0912	24
25	1858	0733	2043	0756	1935	0632	2136	0723	2219	0809	2309	1017	25
26	1954	0809	2144	0833	2037	0711	2237	0819	2307	0915	2346	1120	26
27	2052	0844	2246	0912	2141	0753	2333	0919	2351	1020	---	1221	27
28	2150	0919	2348	0955	2244	0839	---	1021	---	1125	0022	1320	28
29	2249	0954	---	---	2345	0930	0023	1125	0031	1227	0058	1417	29
30	2350	1031	---	---	---	1026	0109	1229	0108	1328	0135	1513	30
31	---	1111	---	---	0042	1126	---	---	0144	1427	---	---	31

Date	July		August		September		October		November		December		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	0214	1607	0313	1718	0436	1751	0515	1733	0703	1807	0756	1837	1
2	0255	1659	0403	1800	0531	1825	0613	1809	0806	1856	0856	1940	2
3	0339	1749	0454	1839	0627	1859	0712	1847	0908	1950	0950	2045	3
4	0426	1836	0548	1915	0723	1933	0813	1928	1008	2049	1039	2150	4
5	0516	1919	0642	1950	0821	2009	0914	2013	1103	2151	1124	2256	5
6	0607	2000	0737	2023	0920	2047	1015	2102	1154	2254	1205	---	6
7	0659	2037	0832	2057	1019	2128	1115	2156	1241	2359	1243	0000	7
8	0753	2113	0928	2131	1120	2214	1212	2255	1323	---	1320	0102	8
9	0846	2147	1026	2207	1211	2305	1306	2357	1403	0103	1356	0203	9
10	0941	2220	1125	2246	1320	---	1355	---	1441	0207	1434	0303	10
11	1037	2254	1226	2329	1417	0002	1441	0102	1518	0309	1513	0402	11
12	1134	2329	1328	---	1511	0103	1523	0207	1556	0410	1555	0500	12
13	1233	---	1430	0018	1600	0208	1603	0312	1635	0511	1639	0555	13
14	1335	0007	1530	0113	1646	0315	1642	0417	1716	0611	1726	0648	14
15	1438	0049	1628	0213	1729	0422	1721	0521	1759	0708	1816	0737	15
16	1542	0136	1722	0319	1809	0529	1800	0623	1845	0803	1906	0823	16
17	1647	0228	1811	0427	1848	0635	1840	0724	1933	0855	1959	0905	17
18	1748	0328	1856	0536	1927	0739	1923	0823	2023	0943	2051	0944	18
19	1845	0433	1937	0644	2007	0841	2007	0920	2115	1027	2145	1021	19
20	1936	0541	2017	0750	2048	0940	2054	1014	2207	1108	2238	1055	20
21	2023	0651	2056	0855	2131	1038	2143	1103	2300	1145	2333	1128	21
22	2105	0759	2134	0957	2215	1132	2233	1149	2354	1221	---	1200	22
23	2145	0905	2213	1057	2302	1223	2324	1231	---	1255	0028	1234	23
24	2222	1009	2253	1154	2351	1310	---	1310	0048	1328	0126	1309	24
25	2259	1111	2336	1248	---	1354	0017	1347	0145	1402	0225	1349	25
26	2336	1210	---	1340	0042	1435	0111	1422	0243	1437	0327	1432	26
27	---	1307	0021	1429	0134	1513	0206	1456	0342	1516	0431	1522	27
28	0015	1402	0108	1515	0228	1549	0302	1531	0445	1558	0536	1617	28
29	0055	1455	0158	1558	0322	1624	0400	1606	0549	1645	0638	1719	29
30	0139	1546	0250	1638	0418	1659	0459	1643	0653	1738	0737	1826	30
31	0224	1634	0342	1715	---	---	0600	1723	---	---	0831	1934	31

TABLE 4
POINT MUGU TIDES

34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER JANUARY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0215	4.1	0820	2.4	1319	3.4	2003	1.1
2	0309	4.4	0956	2.0	1505	3.1	2104	1.4
3	0401	4.8	1109	1.3	1647	3.1	2206	1.0
4	0451	5.3	1208	0.5	1806	3.3	2312	1.7
5	0538	5.8	1255	-0.3	1904	3.6	0008	1.7 ^o
6	0624	6.3	1342	-1.0	1957	3.9	---	---
7	0710	6.8	1427	-1.5	2043	3.2	2043	3.2
8	0757	6.9	1510	-1.7	2127	4.4	2127	4.4
9	0843	6.9	1553	-1.7	2212	4.5	2212	4.5
10	0929	6.7	1636	-1.5	2256	4.6	2256	4.6
11	1017	6.1	1719	-1.0	2345	4.6	2345	4.6
12	0516	1.6	1804	-0.5	---	---	---	---
13	0634	4.6	0619	1.8	1849	0.2	1849	0.2
14	0132	4.6	0738	1.8	1940	0.8	1940	0.8
15	0231	4.6	0911	1.7	2036	1.4	2036	1.4
16	0332	4.7	1044	1.4	2139	1.6	2139	1.6
17	0428	4.9	1159	0.9	2245	2.0	2245	2.0
18	0519	5.0	1245	0.5	2339	2.1	2339	2.1
19	0603	5.2	1327	0.1	1943	3.4	---	---
20	0628	5.1	0640	5.4	2018	3.5	2018	3.5
21	0703	5.1	0714	5.6	2046	3.7	2046	3.7
22	0739	5.0	0747	5.7	2115	3.8	2115	3.8
23	0814	4.9	0816	5.8	2140	3.9	2140	3.9
24	0846	4.8	0845	5.7	2155	-0.6	2155	-0.6
25	0918	4.7	0917	5.6	2208	4.0	2208	4.0
26	0954	4.6	0949	5.3	2237	4.1	2237	4.1
27	1024	4.5	1024	4.9	2306	4.1	2306	4.1
28	1051	4.4	1102	4.5	2341	4.2	2341	4.2
29	0020	4.3	0618	1.8	1824	0.9	1824	0.9
30	0104	4.4	0734	1.8	1909	1.3	1909	1.3
31	0201	4.5	0914	1.5	2011	1.7	2011	1.7

* -- TIDE OCCURS ON NEXT DATE.

TABLE 5

SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST JANUARY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0222	3.8	0830	2.2	1326	3.2	2013	1.0
2	0316	4.1	1006	1.8	1512	2.9	2114	1.3
3	0408	4.5	1119	1.2	1654	2.9	2216	1.5
4	0458	4.9	1218	0.5	1813	3.1	2322	1.5
5	0545	5.4	1305	-0.3	1911	3.4	0014	1.5 ^o
6	0631	5.8	1352	-0.9	2004	3.6	---	---
7	0710	5.5	1437	-1.4	2050	3.0	2050	3.0
8	0757	5.4	1520	-1.5	2134	4.1	2134	4.1
9	0840	5.4	1603	-1.5	2219	4.2	2219	4.2
10	0928	5.3	1646	-1.4	2303	4.3	2303	4.3
11	1017	5.6	1729	-0.9	2352	4.3	2352	4.3
12	0526	1.5	1814	-0.5	---	---	---	---
13	0629	4.3	0629	1.6	1859	0.2	1859	0.2
14	0139	4.3	0748	1.6	1950	0.7	1950	0.7
15	0238	4.3	0921	1.5	2046	1.3	2046	1.3
16	0339	4.4	1054	1.3	2149	1.6	2149	1.6
17	0435	4.6	1209	0.8	2255	1.8	2255	1.8
18	0526	4.6	1255	0.5	2349	1.9	2349	1.9
19	0610	4.8	1337	0.1	---	---	---	---
20	0638	4.9	0647	5.0	2025	3.3	2025	3.3
21	0713	4.9	0721	5.2	2053	3.5	2053	3.5
22	0749	4.8	0754	5.3	2122	3.5	2122	3.5
23	0824	4.7	0823	5.4	2147	3.6	2147	3.6
24	0850	4.6	0852	5.3	2215	3.7	2215	3.7
25	0928	4.5	0924	5.2	2244	3.8	2244	3.8
26	1004	4.4	0956	4.9	2313	3.9	2313	3.9
27	1046	4.6	1031	4.6	2348	3.9	2348	3.9
28	1109	4.2	1109	4.2	---	---	---	---
29	0027	4.0	0628	1.6	1834	0.8	1834	0.8
30	0111	4.1	0744	1.6	1919	1.2	1919	1.2
31	0204	4.2	0924	1.4	2021	1.5	2021	1.5

* -- TIDE OCCURS ON NEXT DATE.

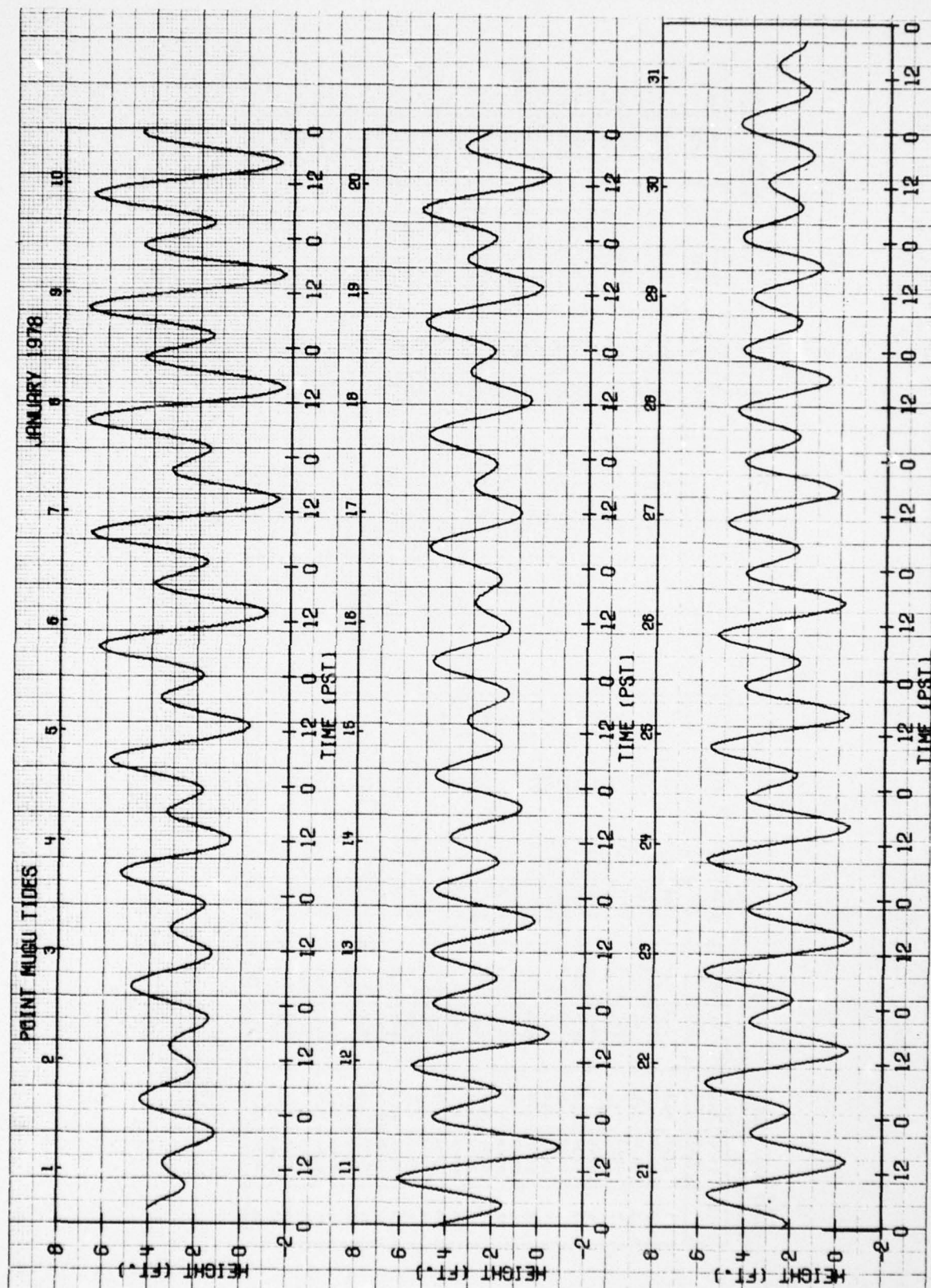


Figure 1. Tidal Graph for Point Mugu, January 1978.

TABLE 6
POINT MUGO TIDES
34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

FEBRUARY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0307	4.8	1043	0.9	1646	2.9	2124	2.0
2	0417	5.2	1152	0.2	1808	3.2	2253	2.0
3	0519	5.6	1244	-0.5	1904	3.6	2359	1.8
4	0613	6.1	1329	-1.0	1949	4.0	---	---
5	0055	1.5	0703	6.4	1412	-1.4	2028	4.3
6	0146	1.2	0749	6.6	1453	1.5	2106	4.6
7	0238	1.0	0837	6.6	1532	-1.4	2145	4.8
8	0322	0.8	0920	6.3	1609	-1.1	2223	4.9
9	0409	0.8	1005	5.8	1647	-0.7	2301	4.9
10	0458	0.9	1050	5.1	1724	-0.1	2343	4.8
11	0553	1.1	1139	4.4	1803	0.5	---	---
12	0626	1.7	1236	3.3	1842	1.2	1424	1.8
13	0719	2.5	1334	2.0	1924	3.0	1954	2.2
14	0815	3.4	1432	0.7	2006	2.7	2211	2.4
15	0915	4.4	1530	0.2	2048	2.4	2325	2.4
16	0441	4.5	1628	0.6	2131	3.1	---	---
17	0532	4.7	1714	3.4	2215	3.4	---	---
18	0616	4.2	1800	5.0	2255	3.6	---	---
19	0055	2.0	1842	5.2	2338	3.8	---	---
20	0132	1.7	1929	5.4	2421	4.0	---	---
21	0204	1.5	2016	5.5	2504	4.2	---	---
22	0236	1.2	2104	5.5	2587	4.4	---	---
23	0304	1.1	2152	5.4	2670	4.6	---	---
24	0346	0.9	2240	5.1	2753	4.8	---	---
25	0422	0.9	2328	4.7	2836	5.0	---	---
26	0511	0.9	1016	4.2	1615	0.0	2128	4.5
27	0603	0.9	1100	3.7	1642	0.3	2205	4.7
28	0015	4.7	1151	3.7	1711	0.7	2255	4.7
			1242	3.1	1748	1.2	2330	4.7
			1305	3.1	1805	1.2	2413	1.7

TABLE 7
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PIER NE COAST

FEBRUARY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0314	4.5	1053	0.8	1653	2.7	2134	1.6
2	0424	4.8	1202	0.2	1815	3.0	2303	1.8
3	0526	5.2	1339	-0.5	1911	3.4	0009	1.6
4	0620	5.6	1422	-0.9	1956	3.7	---	---
5	0105	1.4	0710	5.9	1422	-1.3	2035	4.0
6	0156	1.1	0756	6.1	1503	-1.4	2113	4.3
7	0244	0.9	0844	6.1	1542	-1.3	2152	4.5
8	0332	0.7	0927	5.8	1619	-1.0	2230	4.6
9	0419	0.7	1012	5.4	1657	-0.6	2308	4.6
10	0508	0.8	1057	4.7	1734	-0.1	2350	4.5
11	0603	1.0	1146	4.1	1813	0.5	---	---
12	0633	1.4	1243	3.4	1852	1.1	---	---
13	0726	2.2	1340	1.3	1939	1.6	---	---
14	0826	3.1	1437	0.2	2024	2.0	---	---
15	0930	4.1	1531	0.9	2109	2.7	---	---
16	0446	4.2	1628	0.5	2194	3.2	---	---
17	0539	4.4	1714	0.2	2279	3.7	---	---
18	0626	4.0	1800	0.6	2364	4.2	---	---
19	0715	3.8	1842	0.0	2449	4.7	---	---
20	0804	3.5	1929	0.4	2534	5.2	---	---
21	0854	3.2	2016	0.7	2619	5.7	---	---
22	0944	3.0	2104	1.0	2704	6.2	---	---
23	1034	2.8	2152	1.3	2789	6.7	---	---
24	1124	2.6	2240	1.6	2874	7.2	---	---
25	1214	2.4	2328	1.9	2959	7.7	---	---
26	0104	2.2	2416	2.2	3044	8.2	---	---
27	0154	2.0	2504	2.5	3129	8.7	---	---
28	0244	1.8	2592	2.8	3214	9.2	---	---

* -- TIDE OCCURS ON NEXT DATE.

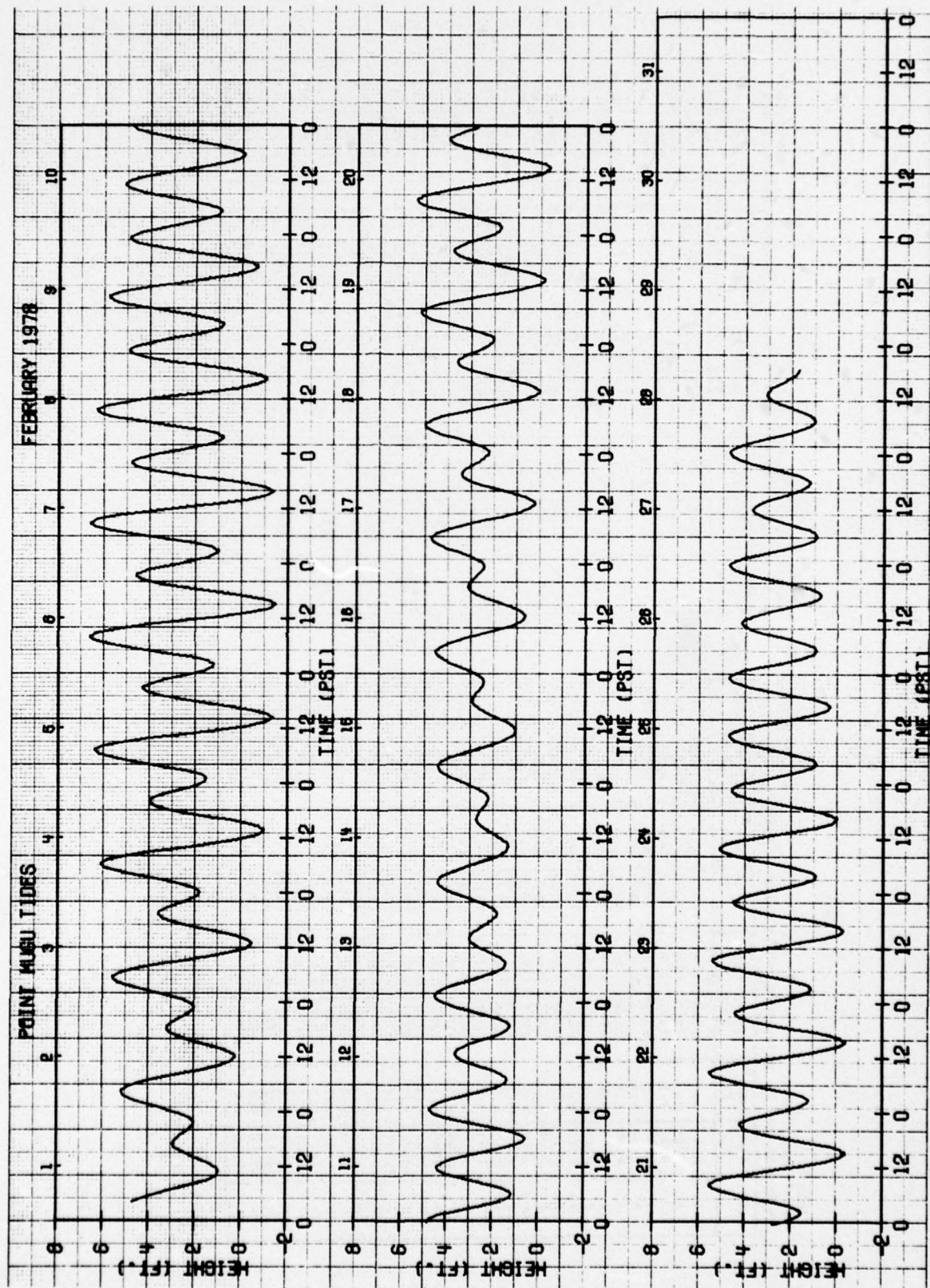


Figure 2. Tidal Graph for Point Mugu, February 1978.

TABLE 8
POINT MUGU TIDES
3° DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

MARCH 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0111	4.7	0842	0.9	1456	2.8	1942	2.1
2	0228	4.7	1018	0.5	1653	3.0	2122	2.3
3	0351	4.9	1130	0.0	1803	3.4	2254	2.1
4	0503	5.2	1226	-0.5	1851	3.8	0002	1.7*
5	0603	5.6	1311	-0.8	1927	4.2	---	---
6	0655	1.2	0658	5.9	1351	-1.0	2005	4.6
7	0145	0.8	0743	6.0	1429	-1.0	2037	4.9
8	0229	0.4	0829	5.9	1505	-0.8	2112	5.1
9	0312	0.2	0912	5.6	1537	-0.5	2144	5.2
10	0356	0.1	0954	5.1	1612	0.0	2219	5.2
11	0439	0.2	1035	4.6	1644	0.5	2252	5.0
12	0524	0.4	1120	4.0	1716	1.0	2327	4.8
13	0617	0.7	1215	3.4	1748	1.6	---	---
14	0710	4.5	0722	1.0	1829	2.9	1827	2.1
15	0803	4.2	0848	1.1	1935	2.7	1930	2.5
16	0213	4.0	1021	1.0	1731	2.9	2132	2.6
17	0344	4.0	1130	0.7	1823	3.2	2306	2.5
18	0457	4.1	1218	0.4	1853	3.5	0002	2.2*
19	0552	4.4	1252	0.2	1917	3.8	---	---
20	0642	1.8	0632	4.7	1321	0.0	1938	4.0
21	0115	1.4	0706	4.9	1349	-0.1	2000	4.3
22	0147	1.0	0743	5.0	1415	-0.1	2021	4.6
23	0221	0.6	0817	5.0	1442	0.0	2046	4.8
24	0256	0.3	0853	4.9	1511	0.1	2112	5.0
25	0333	0.1	0932	4.7	1540	0.4	2144	5.2
26	0413	-0.1	1016	4.4	1609	0.7	2216	5.2
27	0459	-0.1	1104	4.0	1644	1.1	2255	5.2
28	0553	0.0	1202	3.5	1722	1.6	2341	5.0
29	0702	0.2	1326	3.1	1814	2.0	---	---
30	0041	4.8	0823	0.2	1512	3.0	1942	2.4
31	0200	4.6	0949	0.1	1644	3.3	2134	2.4

* --- TIDE OCCURS ON NEXT DATE.

TABLE 9
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST

MARCH 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0118	4.4	0852	0.8	1503	2.6	1952	1.9
2	0235	4.4	1028	0.5	1700	2.8	2132	2.1
3	0358	4.6	1140	0.0	1810	3.2	2304	1.9
4	0510	4.8	1236	-0.5	1858	3.5	0012	1.5*
5	0610	5.2	1321	-0.7	1934	3.9	---	---
6	0105	1.1	0705	5.5	1401	-0.9	2012	4.3
7	0155	0.7	0750	5.6	1439	-0.9	2044	4.6
8	0239	0.4	0836	5.5	1515	-0.7	2119	4.7
9	0322	0.2	0919	5.2	1547	-0.5	2151	4.8
10	0406	0.1	1001	4.7	1622	0.0	2226	4.8
11	0449	0.2	1042	4.3	1654	0.5	2259	4.6
12	0534	0.4	1127	3.7	1726	0.9	2334	4.5
13	0627	0.6	1222	3.2	1758	1.5	---	---
14	0017	4.2	0732	0.9	1336	2.7	1837	1.9
15	0110	3.9	0858	1.0	1542	2.5	1940	2.3
16	0220	3.7	1031	0.9	1738	2.7	2142	2.5
17	0351	3.7	1140	0.6	1830	3.0	2316	2.3
18	0504	3.8	1228	0.4	1900	3.3	0012	2.0*
19	0559	4.1	1302	0.2	1924	3.5	---	---
20	0052	1.6	0639	4.4	1331	0.0	1945	3.7
21	0125	1.3	0713	4.6	1359	-0.1	2007	4.0
22	0157	0.9	0750	4.6	1425	-0.1	2028	4.3
23	0231	0.5	0824	4.6	1452	0.0	2053	4.5
24	0306	0.3	0900	4.6	1521	0.1	2119	4.6
25	0343	0.1	0939	4.4	1550	0.4	2151	4.8
26	0423	-0.1	1023	4.1	1619	0.6	2223	4.6
27	0509	-0.1	1111	3.7	1654	1.0	2302	4.8
28	0603	0.0	1209	3.3	1732	1.5	2348	4.6
29	0712	0.2	1333	2.9	1824	1.8	---	---
30	0048	4.5	0833	0.2	1519	2.8	1952	2.2
31	0207	4.3	0959	0.1	1651	3.1	2144	2.2

* --- TIDE OCCURS ON NEXT DATE.

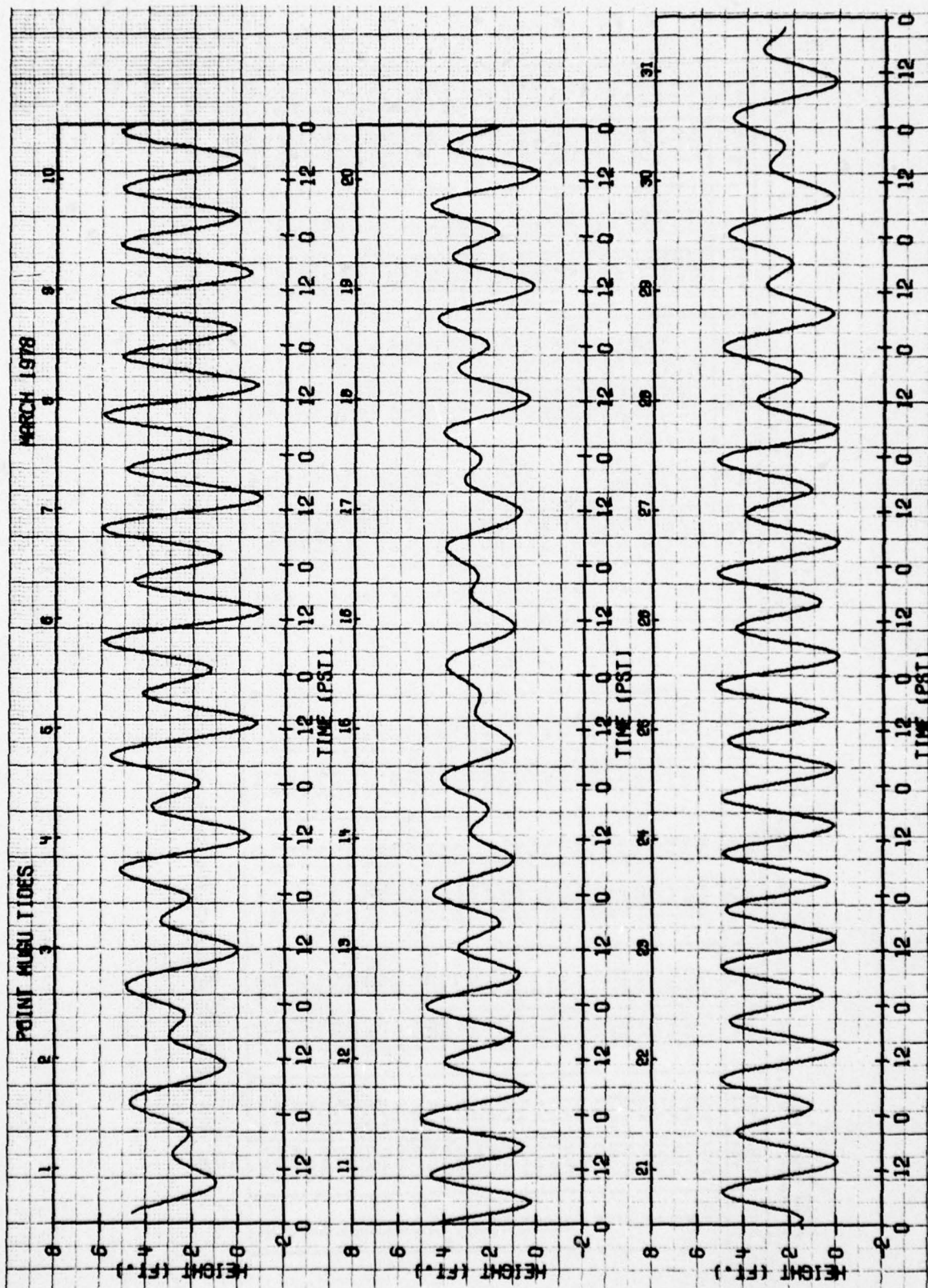


Figure 3. Tidal Graph for Point Mugu, March 1978.

TABLE 10
POINT MUGU TIDES
34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

APRIL 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0332	4.6	1201	-0.1	1744	3.8	2304	2.0
2	0451	4.7	1158	-0.3	1824	4.2	0007	1.4*
3	0555	5.0	1244	-0.5	1901	4.6	---	---
4	0649	5.1	1323	-0.4	1933	5.0	1933	5.0
5	0738	5.1	1358	-0.3	2005	5.3	2005	5.3
6	0821	5.0	1433	-0.0	2037	5.4	2037	5.4
7	0902	4.8	1504	0.3	2108	5.5	2108	5.5
8	0944	4.4	1533	0.7	2138	5.4	2138	5.4
9	1026	4.1	1605	1.1	2208	5.2	2208	5.2
10	1112	3.6	1633	1.6	2239	4.9	2239	4.9
11	1202	3.2	1705	2.0	2314	4.6	2314	4.6
12	1312	2.9	1737	2.4	2357	4.2	2357	4.2
13	1502	2.9	1843	2.6	---	---	---	---
14	0908	0.8	1646	3.1	2048	2.7	2048	2.7
15	0228	3.7	1734	3.4	2240	2.5	2240	2.5
16	0357	3.7	1800	3.7	2336	2.1	2336	2.1
17	0506	3.8	1827	4.0	---	---	---	---
18	0618	1.6	1829	4.1	1849	4.3	1849	4.3
19	0720	4.4	1829	4.1	1914	4.7	1914	4.7
20	0801	4.5	1800	4.4	1939	5.1	1939	5.1
21	0929	4.3	1710	1.9	2005	5.4	2005	5.4
22	1016	4.1	1623	1.5	2037	5.6	2037	5.6
23	1111	3.8	1507	0.9	2110	5.8	2110	5.8
24	1215	3.5	1541	1.2	2148	5.8	2148	5.8
25	1334	3.4	1623	1.5	2231	5.6	2231	5.6
26	1453	0.9	1710	1.9	2320	5.3	2320	5.3
27	0651	-0.7	1819	2.3	---	---	---	---
28	0803	-0.3	1500	3.5	1956	2.5	1956	2.5
29	0917	-0.2	1614	3.8	2139	2.2	2139	2.2
30	1024	-0.1	1708	4.3	2303	1.7	2303	1.7

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 11
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST

APRIL 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0339	4.3	1111	-0.1	1751	3.5	2314	1.8
2	0458	4.4	1208	-0.3	1831	3.9	0017	1.3*
3	0602	4.6	1254	-0.5	1908	4.3	---	---
4	0707	4.7	1333	-0.4	1940	4.6	1940	4.6
5	0823	4.6	1408	-0.3	2012	4.9	2012	4.9
6	0909	4.5	1443	0.0	2044	5.0	2044	5.0
7	0951	4.1	1514	0.3	2115	5.1	2115	5.1
8	1033	3.8	1543	0.6	2145	5.0	2145	5.0
9	1119	3.4	1615	1.0	2215	4.8	2215	4.8
10	1209	3.0	1643	1.5	2246	4.6	2246	4.6
11	1319	2.7	1715	1.8	2321	4.3	2321	4.3
12	1509	2.7	1747	2.2	0004	3.9*	---	---
13	0918	0.7	1853	2.5	---	---	---	---
14	0102	3.6	1653	2.9	2058	2.5	2058	2.5
15	0235	3.5	1741	3.2	2250	2.4	2250	2.4
16	0404	3.5	1807	3.5	2346	1.9	2346	1.9
17	0513	3.5	1834	3.7	---	---	---	---
18	0603	3.8	1839	0.4	1856	4.0	1856	4.0
19	0727	4.1	1921	4.4	1921	4.4	1921	4.4
20	0808	4.2	1946	4.7	1946	4.7	1946	4.7
21	0850	4.1	2012	5.0	2012	5.0	2012	5.0
22	0936	4.0	2044	5.2	2044	5.2	2044	5.2
23	1023	3.8	2117	5.4	2117	5.4	2117	5.4
24	1118	3.5	2155	5.4	2155	5.4	2155	5.4
25	1222	3.3	2238	5.2	2238	5.2	2238	5.2
26	1341	3.2	2327	4.9	2327	4.9	2327	4.9
27	1442	0.5	2006	2.3	2006	2.3	2006	2.3
28	1507	3.3	2149	2.0	2149	2.0	2149	2.0
29	1621	3.5	2313	1.5	2313	1.5	2313	1.5

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

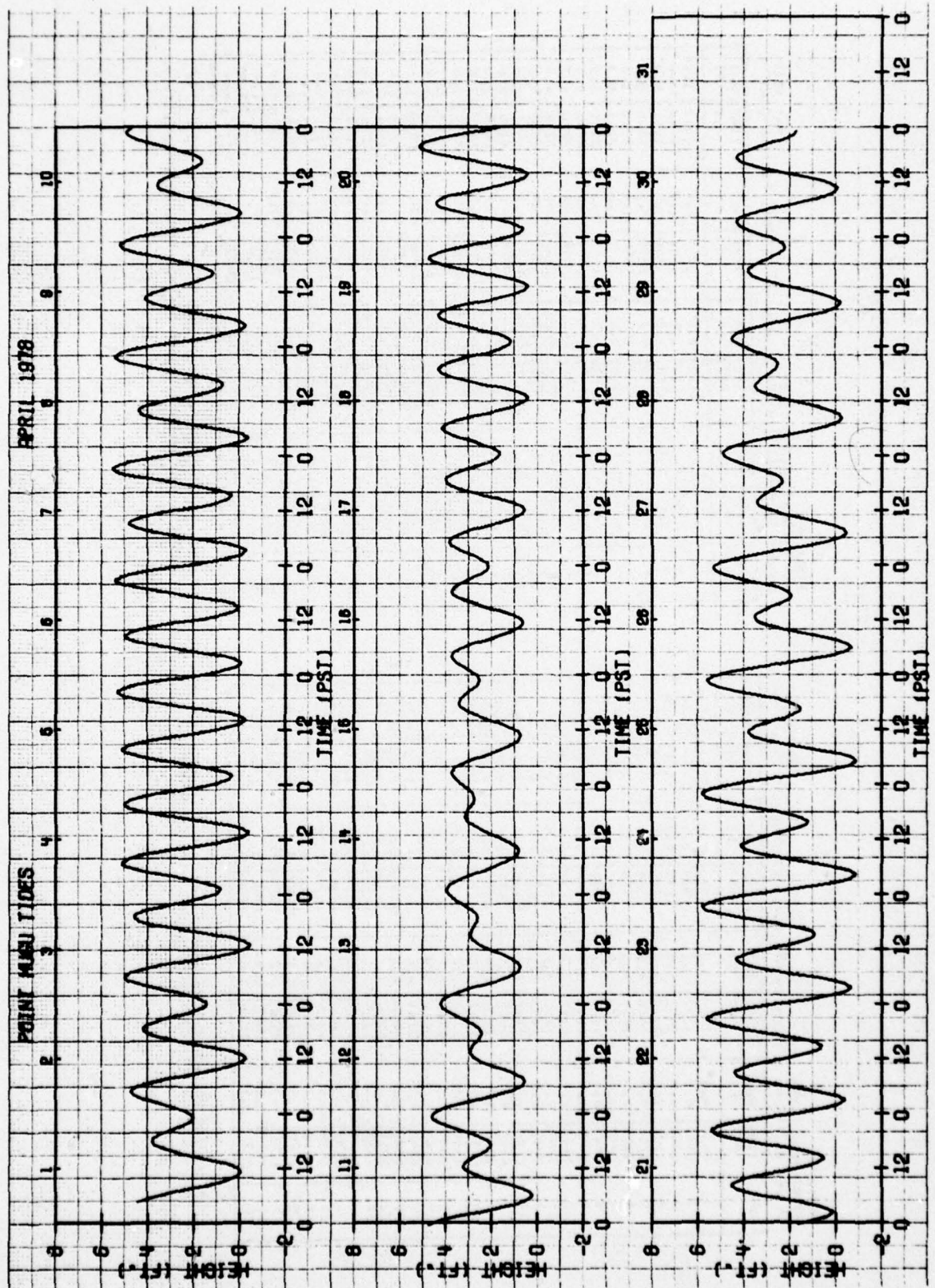


Figure 4. Tidal Graph for Point Mugu, April 1978.

TABLE 12
POINT MUGU TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER
MAY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0436	4.2	1120	0.0	1752	4.7	0002	1.1*		
2	0545	4.3	1207	0.1	1829	5.1	0902	---		
3	0652	4.5	1248	0.3	1904	5.4	1904	5.4		
4	0137	0.0	1325	0.5	1933	5.6	2005	5.7		
5	0217	-0.3	1358	0.8	2005	5.7	2034	5.7		
6	0254	-0.5	1429	1.1	2034	5.7	2104	5.6		
7	0332	-0.6	1457	1.4	2104	5.6	2131	5.4		
8	0407	-0.6	1527	1.7	2131	5.4	2203	5.1		
9	0443	-0.4	1558	2.0	2203	5.1	2235	4.8		
10	0524	-0.2	1633	2.3	2235	4.8	2313	4.5		
11	0609	0.1	1713	2.5	2313	4.5	---	---		
12	0702	0.3	1814	2.7	---	---	1956	2.8		
13	0802	0.1	1932	3.3	1956	2.8	2148	2.6		
14	0911	3.7	2022	3.6	2148	2.6	2258	2.2		
15	0244	3.5	0958	0.8	1658	3.9	2349	1.6		
16	0410	3.4	1047	0.8	1728	4.3	---	---		
17	0516	3.5	1128	0.8	1756	4.7	1825	5.1		
18	0629	1.0	1205	0.9	1825	5.1	1958	5.5		
19	0108	0.3	1242	0.9	1958	5.5	2047	6.4		
20	0148	-0.3	1321	1.0	2047	6.4	2128	6.3		
21	0228	-0.8	1358	1.2	2128	6.3	2216	6.1		
22	0311	-1.2	1438	1.3	2216	6.1	2310	5.6		
23	0357	-1.4	1524	1.5	2310	5.6	---	---		
24	0447	-1.4	1612	1.8	---	---	1954	2.3		
25	0539	-1.2	1708	2.1	1954	2.3	2128	2.0		
26	0635	-0.9	1822	2.3	2128	2.0	2251	1.5		
27	0012	5.1	1431	4.1	2251	1.5	2354	0.9		
28	0125	4.5	1533	4.4	2354	0.9	---	---		
29	0252	4.0	1629	4.7	---	---				
30	0417	3.8	1715	5.1						
31	0534	3.7	1756	5.4						

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 13
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST
MAY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0443	3.9	1130	0.0	1754	4.4	0012	1.0*		
2	0552	4.0	1217	0.1	1836	4.7	---	---		
3	0102	0.5	1258	0.3	1911	5.0	1911	5.0		
4	0147	0.0	1335	0.5	1940	5.2	2012	5.3		
5	0227	-0.3	1408	0.7	2012	5.3	2041	5.3		
6	0304	-0.5	1439	1.0	2041	5.3	2111	5.2		
7	0342	-0.5	1507	1.3	2111	5.2	2138	5.0		
8	0417	-0.5	1537	1.5	2138	5.0	2210	4.7		
9	0453	-0.4	1608	1.8	2210	4.7	2242	4.5		
10	0534	-0.2	1643	2.1	2242	4.5	2320	4.2		
11	0619	0.1	1723	2.4	2320	4.2	---	---		
12	0712	0.3	1824	2.5	---	---	2006	2.6		
13	0809	3.8	1909	0.5	1539	3.1	2158	2.5		
14	0118	3.5	0912	0.6	1629	3.4	2308	2.0		
15	0251	3.3	1008	0.7	1706	3.6	---	---		
16	0417	3.2	1057	0.7	1735	4.0	2359	1.5		
17	0523	3.3	1138	0.7	1803	4.4	---	---		
18	0639	0.9	1215	0.8	1832	4.7	---	---		
19	0116	0.3	1252	0.8	1905	5.1	1937	5.5		
20	0158	-0.3	1331	0.9	1937	5.5	2015	5.7		
21	0238	-0.7	1408	1.1	2015	5.7	2054	5.9		
22	0321	-1.1	1448	1.2	2054	5.9	2135	5.8		
23	0407	-1.3	1534	1.4	2135	5.8	2223	5.6		
24	0457	-1.3	1622	1.6	2223	5.6	2317	5.2		
25	0549	-1.1	1718	1.9	2317	5.2	---	---		
26	0645	-0.8	1832	2.1	---	---	2004	2.1		
27	0019	4.7	1438	3.8	2004	2.1	2138	1.8		
28	0132	4.2	1540	4.1	2138	1.8	2301	1.4		
29	0259	3.7	1636	4.4	2301	1.4	---	---		
30	0424	3.5	1722	4.7	---	---	0004	0.8*		
31	0541	3.5	1803	5.0	0004	0.8*	---	---		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

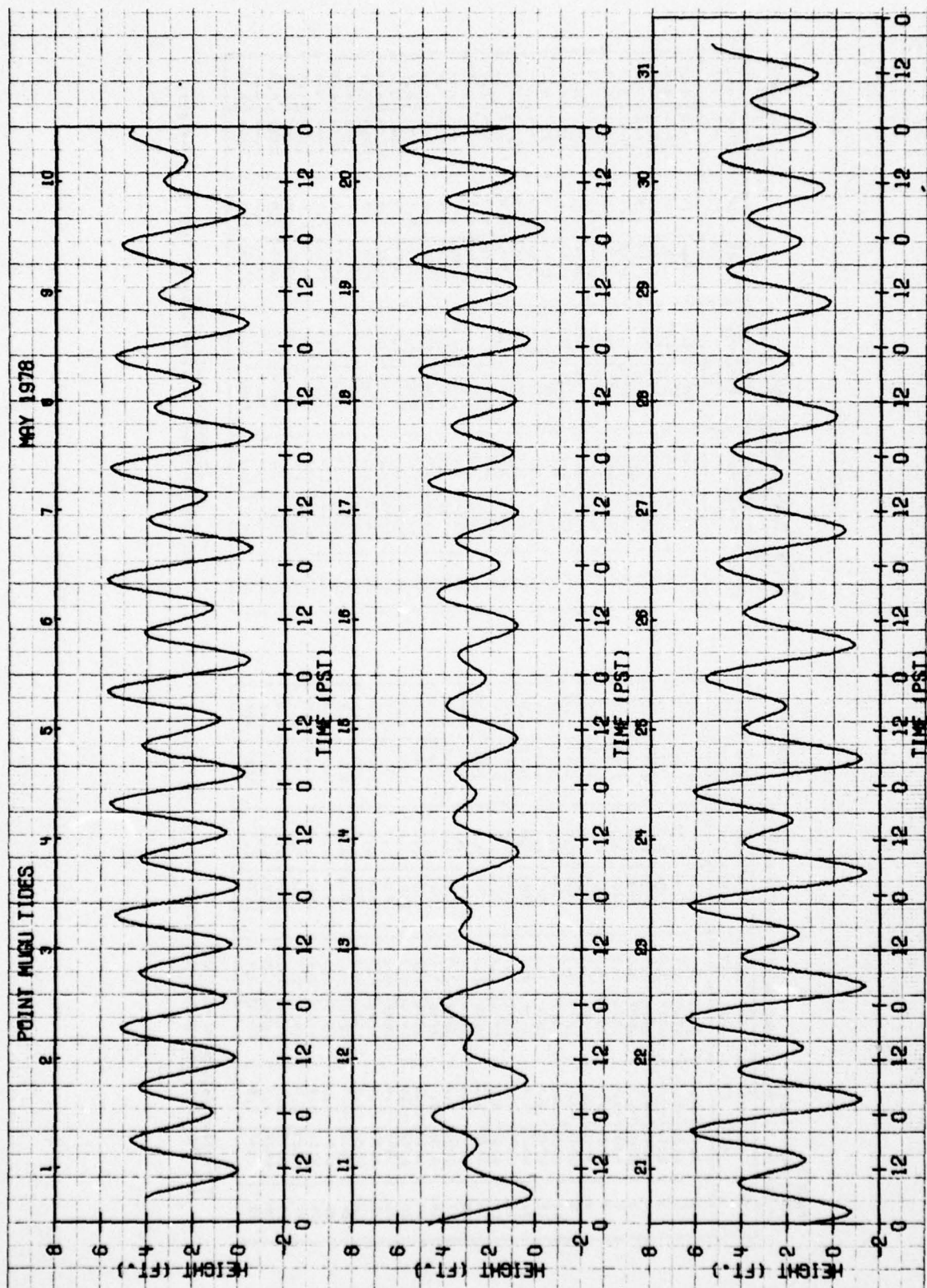


Figure 5. Tidal Graph for Point Mugu, May 1978.

TABLE 14
POINT MUGU TIDES

34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

JUNE 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0046	0.4	0637	3.7	1214	1.1	1835	5.6		
2	0131	-0.1	0730	3.7	1253	1.3	1907	5.7		
3	0210	-0.4	0817	3.7	1324	1.5	1936	5.8		
4	0245	-0.5	0856	3.7	1400	1.7	2007	5.8		
5	0321	-0.6	0937	3.6	1432	1.9	2036	5.7		
6	0353	-0.6	1014	3.6	1504	2.1	2105	5.6		
7	0428	-0.5	1056	3.5	1536	2.2	2137	5.4		
8	0503	-0.3	1138	3.5	1614	2.4	2213	5.1		
9	0542	-0.1	1228	3.5	1654	2.5	2248	4.8		
10	0621	0.1	1317	3.5	1750	2.7	2330	4.4		
11	0703	0.4	1409	3.6	1907	2.7	---	---		
12	0749	0.7	1501	3.8	2042	2.6	---	---		
13	0841	0.9	1548	4.1	2209	2.2	---	---		
14	0933	1.1	1625	4.5	2314	1.6	---	---		
15	1024	1.3	1705	5.0	0004	0.9*	---	---		
16	1114	1.4	1744	5.5	---	---	---	---		
17	1200	1.5	1822	5.9	---	---	---	---		
18	1245	1.5	1904	6.4	---	---	---	---		
19	1334	1.5	1946	6.7	---	---	---	---		
20	1423	1.6	2030	6.8	---	---	---	---		
21	1512	1.7	2117	6.7	---	---	---	---		
22	1606	1.8	2206	6.4	---	---	---	---		
23	1705	1.9	2301	5.8	---	---	---	---		
24	1812	2.0	2357	5.2	---	---	---	---		
25	1934	2.0	---	---	---	---	---	---		
26	2030	2.0	---	---	---	---	---	---		
27	2137	1.8	---	---	---	---	---	---		
28	2232	1.4	---	---	---	---	---	---		
29	2342	0.9	---	---	---	---	---	---		
30	1807	5.6	---	---	---	---	---	---		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.TABLE 15
SAN NICOLAS ISLAND TIDES

33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

JUNE 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0056	0.4	0644	3.5	1224	1.0	1842	5.2		
2	0141	-0.1	0737	3.5	1303	1.2	1914	5.3		
3	0220	-0.4	0824	3.5	1334	1.4	1943	5.4		
4	0255	-0.5	0903	3.5	1410	1.5	2014	5.4		
5	0331	-0.5	0944	3.4	1442	1.7	2043	5.3		
6	0403	-0.5	1021	3.4	1514	1.9	2112	5.2		
7	0438	-0.5	1103	3.3	1546	2.0	2144	5.0		
8	0513	-0.3	1145	3.3	1624	2.2	2220	4.7		
9	0552	-0.1	1235	3.3	1704	2.4	2255	4.5		
10	0631	0.1	1324	3.3	1800	2.5	2337	4.1		
11	0713	0.4	1416	3.4	1917	2.5	---	---		
12	0800	0.6	1508	3.5	2052	2.5	---	---		
13	0851	0.8	1555	3.8	2219	2.0	---	---		
14	0943	1.0	1632	4.2	2324	1.5	---	---		
15	1034	1.2	1712	4.6	0014	0.8*	---	---		
16	1124	1.3	1751	5.1	---	---	---	---		
17	1210	1.4	1829	5.5	---	---	---	---		
18	1255	1.4	1911	5.9	---	---	---	---		
19	1344	1.4	1953	6.2	---	---	---	---		
20	1433	1.5	2037	6.3	---	---	---	---		
21	1522	1.5	2124	6.2	---	---	---	---		
22	1616	1.6	2213	5.9	---	---	---	---		
23	1715	1.7	2308	5.4	---	---	---	---		
24	1822	1.8	0004	4.8*	---	---	---	---		
25	1944	1.8	---	---	---	---	---	---		
26	2113	1.6	---	---	---	---	---	---		
27	2242	1.3	---	---	---	---	---	---		
28	2352	0.8	---	---	---	---	---	---		
29	1814	5.2	---	---	---	---	---	---		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

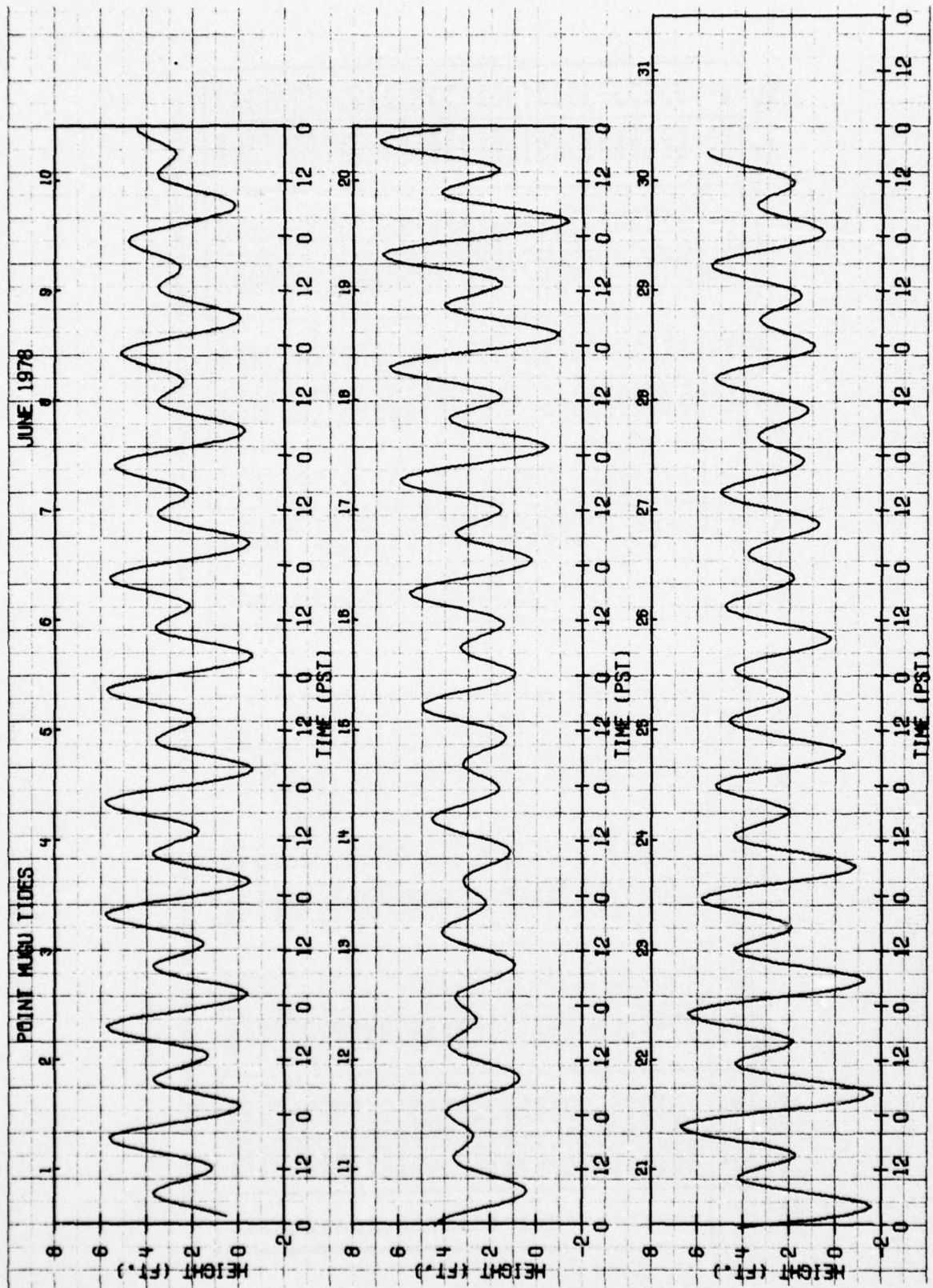


Figure 6. Tidal Graph for Point Mugu, June 1978.

TABLE 16
POINT MUGU TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER
JULY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0123	0.1	0730	3.5	1228	1.9	1843	5.7
2	0201	-0.2	0816	3.6	1304	2.1	1915	5.8
3	0233	-0.4	0853	3.7	1341	2.1	1947	5.9
4	0309	-0.4	0927	3.7	1413	2.2	2018	5.8
5	0337	-0.5	0959	3.8	1448	2.2	2050	5.8
6	0407	-0.4	1011	3.8	1519	2.2	2122	5.6
7	0434	-0.3	1103	3.8	1558	2.3	2153	5.4
8	0510	-0.1	1141	3.9	1639	2.4	2229	5.0
9	0542	0.2	1217	3.9	1729	2.5	2304	4.6
10	0614	0.5	1259	4.0	1828	2.5	2350	4.1
11	0704	0.9	1345	4.2	1947	2.5	---	---
12	0750	3.6	0733	1.2	1433	4.4	2116	2.2
13	0822	3.2	0827	1.5	1527	4.8	2139	1.6
14	0806	3.0	0926	1.8	1617	5.2	2241	0.9
15	0534	3.2	1032	1.9	1708	5.7	---	---
16	0034	0.2	0840	3.5	1134	2.0	1756	6.1
17	0119	-0.5	0733	3.8	1230	1.9	1845	6.6
18	0204	-1.0	0820	4.1	1322	1.7	1934	6.9
19	0247	-1.4	0902	4.4	1413	1.6	2020	7.0
20	0330	-1.5	0947	4.6	1504	1.5	2108	6.8
21	0412	-1.3	1032	4.8	1556	1.4	2157	6.5
22	0455	-1.0	1117	4.9	1652	1.5	2247	5.9
23	0540	-0.5	1204	4.9	1755	1.6	2340	5.1
24	0625	0.1	1256	5.0	1806	1.7	---	---
25	0704	4.3	0713	0.8	1353	5.0	2030	1.7
26	0204	3.7	0806	1.4	1454	5.0	2200	1.4
27	0342	3.3	0911	1.9	1556	5.1	2322	1.1
28	0521	3.2	1020	2.2	1651	5.3	---	---
29	0623	0.7	0634	3.4	1120	2.3	1742	5.4
30	0106	0.3	0723	3.6	1212	2.4	1822	5.6
31	0143	0.1	0801	3.8	1253	2.3	1859	5.7

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 17
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST
JULY 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0133	0.1	0737	3.3	1238	1.7	1850	5.3		
2	0211	-0.2	0823	3.4	1314	1.9	1922	5.4		
3	0243	-0.4	0900	3.5	1351	1.9	1954	5.5		
4	0319	-0.4	0934	3.5	1423	2.0	2025	5.4		
5	0347	-0.5	1006	3.5	1456	2.0	2057	5.4		
6	0417	-0.4	1038	3.5	1529	2.0	2129	5.2		
7	0448	-0.3	1110	3.5	1604	2.1	2200	5.0		
8	0520	-0.1	1148	3.6	1649	2.2	2236	4.6		
9	0552	0.2	1224	3.6	1739	2.3	2311	4.3		
10	0624	0.5	1306	3.7	1838	2.3	2357	3.8		
11	0714	0.8	1352	3.9	1957	2.3	---	---		
12	0057	3.4	0743	1.1	1440	4.1	2126	2.0		
13	0229	3.0	0837	1.4	1534	4.5	2249	1.5		
14	0413	2.8	0936	1.6	1624	4.8	2351	0.8		
15	0541	3.0	1042	1.7	1715	5.3	---	---		
16	0644	0.2	0647	3.3	1144	1.8	1803	5.6		
17	0129	-0.5	0740	3.5	1240	1.7	1852	6.1		
18	0214	-0.9	0827	3.8	1332	1.5	1941	6.4		
19	0257	-1.3	0909	4.1	1423	1.5	2027	6.5		
20	0340	-1.4	0954	4.3	1514	1.4	2115	6.3		
21	0422	-1.2	1039	4.5	1606	1.3	2204	6.0		
22	0505	-0.9	1124	4.6	1702	1.4	2254	5.5		
23	0550	-0.5	1211	4.6	1805	1.5	2347	4.7		
24	0635	0.1	1303	4.6	1916	1.5	---	---		
25	0051	4.0	0723	0.7	1400	4.6	2040	1.5		
26	0211	3.5	0816	1.3	1501	4.6	2210	1.3		
27	0349	3.1	0921	1.7	1603	4.7	2332	1.0		
28	0528	3.0	1030	2.0	1658	4.9	---	---		
29	0033	0.6	0841	3.2	1130	2.1	1749	5.0		
30	0116	0.3	0930	3.4	1222	2.2	1829	5.2		
31	0153	0.1	0808	3.5	1303	2.1	1906	5.3		

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

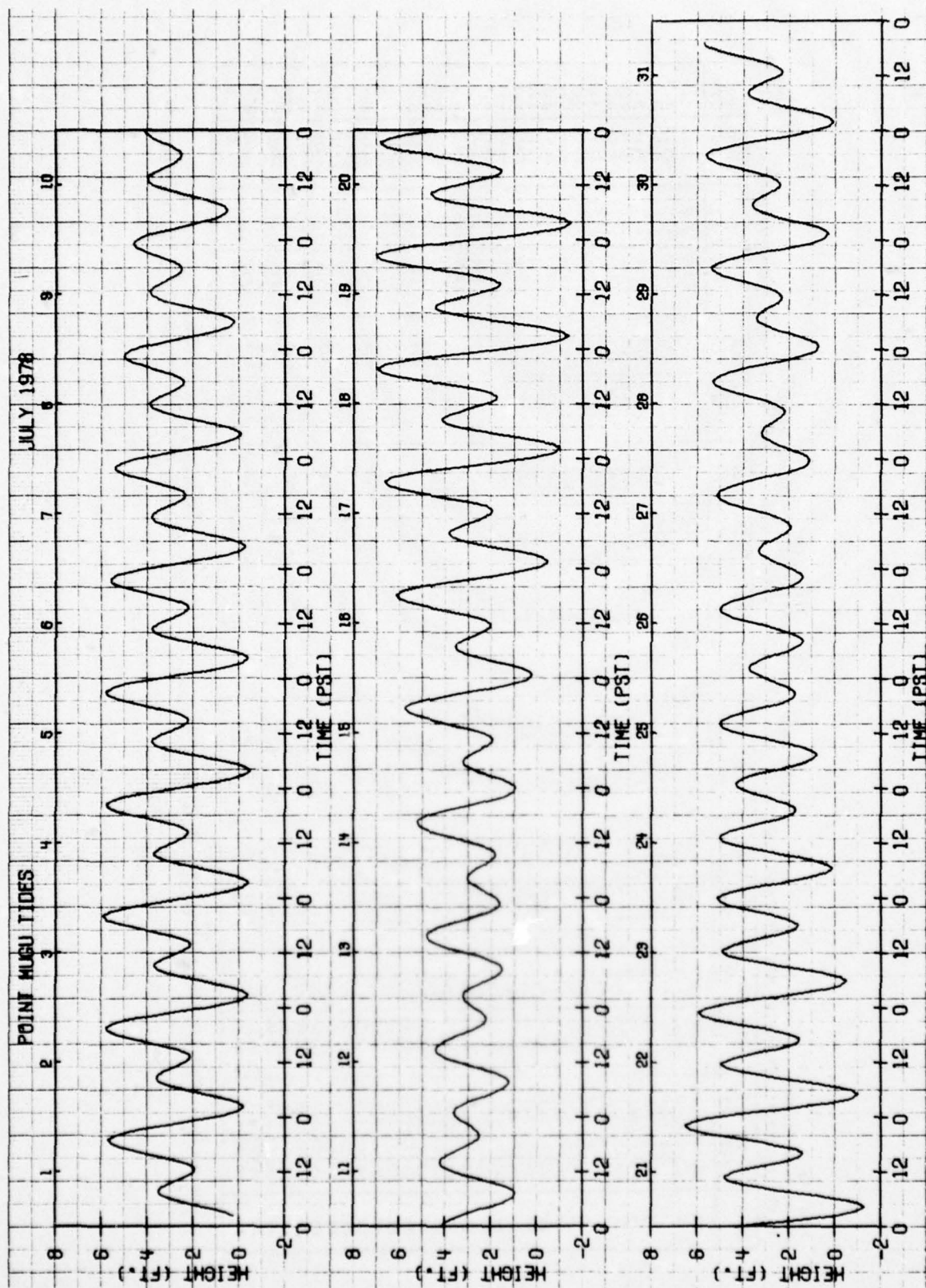


TABLE 18

POINT MUGU TIDES

34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

AUGUST 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0217	-0.1	0833	3.9	1329	2.2	1934	5.8
2	0245	-0.2	0901	4.0	1404	2.1	2006	5.9
3	0313	-0.2	0927	4.1	1436	2.0	2035	5.8
4	0338	-0.2	0952	4.2	1512	1.9	2107	5.7
5	0407	0.0	1021	4.3	1546	1.9	2139	5.4
6	0432	0.2	1049	4.4	1623	1.9	2211	5.1
7	0500	0.5	1120	4.5	1705	2.0	2250	4.7
8	0529	0.8	1156	4.5	1758	2.0	2334	4.2
9	0601	1.2	1236	4.6	1904	2.0	2333	1.8
10	0633	1.6	0640	1.6	1326	4.7	2203	1.4
11	0707	3.2	0731	2.0	1429	4.9	2316	0.8
12	0402	3.1	0850	2.3	1539	5.2	---	---
13	0537	3.3	1013	2.4	1643	5.6	---	---
14	0615	0.1	0635	3.7	1126	2.2	1742	6.1
15	0101	-0.4	0719	4.1	1228	1.9	1835	6.5
16	0145	-0.8	0759	4.5	1319	1.6	1925	6.8
17	0226	-1.0	0840	4.9	1409	1.2	2011	6.8
18	0306	-1.0	0917	5.1	1457	1.0	2057	6.6
19	0346	-0.8	0957	5.3	1545	0.9	2145	6.2
20	0423	-0.4	1035	5.4	1638	0.9	2234	5.6
21	0503	0.2	1117	5.3	1732	1.0	2324	4.9
22	0542	0.8	1202	5.2	1835	1.2	---	---
23	0623	4.1	0627	1.5	1252	5.0	1951	1.4
24	0144	3.5	0716	2.1	1355	4.9	2118	1.4
25	0333	3.2	0825	2.5	1504	4.8	2250	1.2
26	0523	3.3	0951	2.6	1617	4.8	2351	0.9
27	0625	3.6	1109	2.6	1716	5.0	---	---
28	0039	0.6	0706	3.8	1205	2.5	1803	5.2
29	0113	0.4	0735	4.0	1246	2.3	1843	5.4
30	0145	0.2	0801	4.2	1321	2.0	1916	5.6
31	0212	0.1	0823	4.4	1351	1.8	1951	5.7

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 19

SAN NICOLAS ISLAND TIDES

33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST

AUGUST 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0227	-0.1	0840	3.6	1339	2.0	1941	5.4
2	0255	-0.2	0908	3.7	1414	1.9	2013	5.5
3	0323	-0.2	0934	3.8	1446	1.8	2042	5.4
4	0348	-0.2	0959	3.9	1522	1.7	2114	5.3
5	0417	0.0	1028	4.0	1556	1.7	2146	5.0
6	0442	0.2	1056	4.1	1633	1.7	2218	4.7
7	0510	0.5	1127	4.2	1715	1.8	2257	4.4
8	0539	0.7	1203	4.2	1808	1.8	2341	3.9
9	0611	1.1	1243	4.3	1914	1.8	---	---
10	0640	3.4	0650	1.5	1333	4.4	2043	1.0
11	0214	3.0	0741	1.8	1436	4.6	2113	1.3
12	0409	2.9	0900	2.1	1546	4.8	2326	0.7
13	0544	3.1	1023	2.2	1650	5.2	---	---
14	0625	0.1	0642	3.5	1136	2.0	1749	5.6
15	0111	-0.4	0726	3.8	1238	1.7	1842	6.0
16	0155	-0.7	0806	4.2	1329	1.5	1932	6.3
17	0236	-0.9	0847	4.6	1419	1.1	2018	6.3
18	0316	-0.9	0924	4.7	1507	0.9	2104	6.1
19	0356	-0.7	1004	4.9	1555	0.8	2152	5.7
20	0433	-0.4	1042	5.0	1648	0.8	2241	5.2
21	0513	0.2	1124	4.9	1742	0.9	2331	4.6
22	0552	0.7	1209	4.8	1845	1.1	---	---
23	0630	3.8	0637	1.4	1259	4.6	2001	1.3
24	0151	3.3	0726	1.9	1402	4.6	2128	1.3
25	0340	3.0	0835	2.3	1511	4.5	2200	1.1
26	0530	3.1	1001	2.5	1624	4.5	0001	0.8
27	0632	3.4	1119	2.5	1723	4.6	---	---
28	0049	0.5	0713	3.5	1215	2.3	1810	4.8
29	0123	0.4	0742	3.7	1256	2.1	1850	5.0
30	0155	0.2	0808	3.9	1331	1.8	1923	5.2
31	0222	0.1	0830	4.1	1401	1.6	1958	5.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

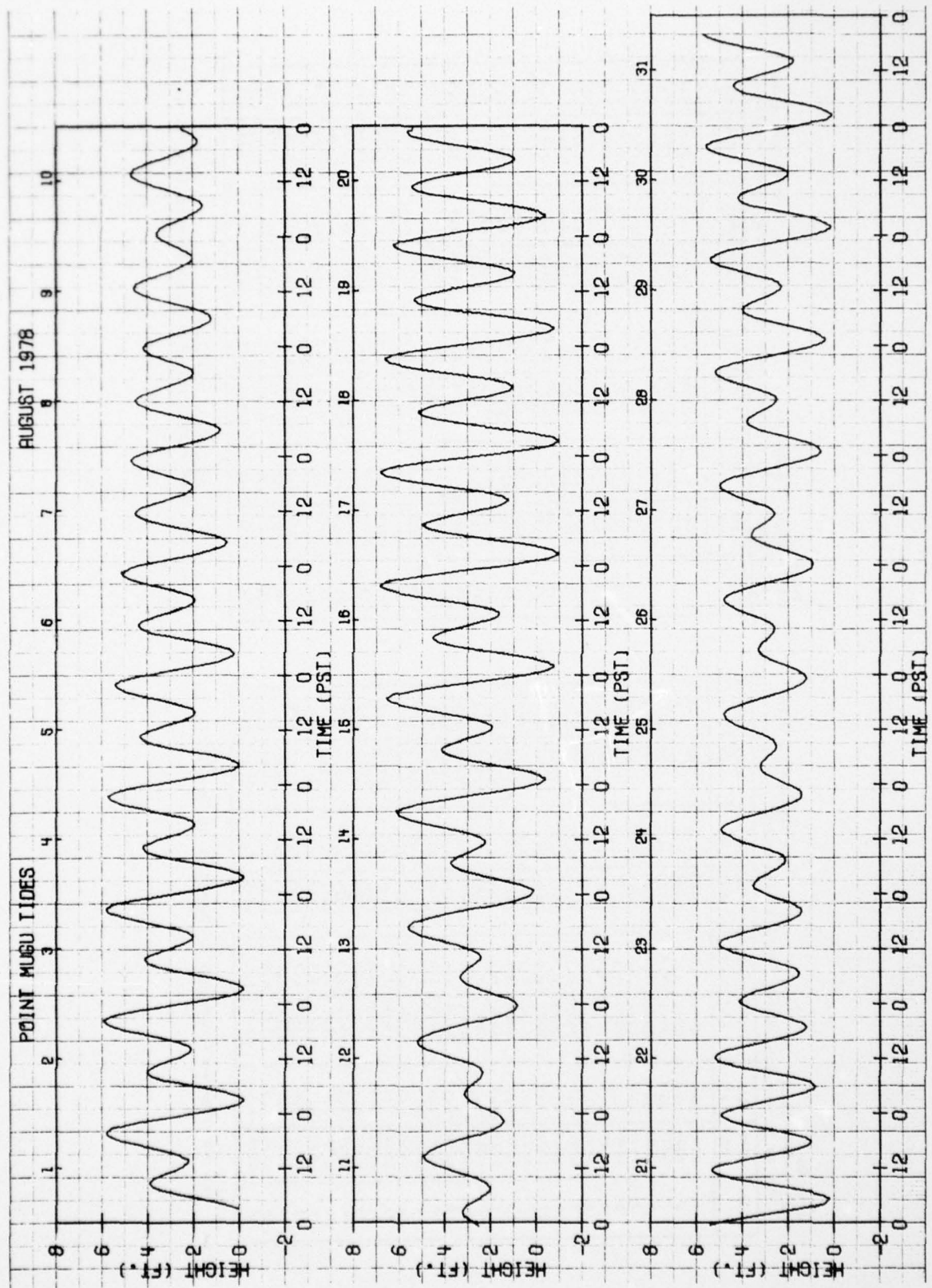


Figure 8. Tidal Graph for Point Mugu, August 1978.

TABLE 20
POINT MUGO TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER
SEPTEMBER 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0237	0.1	0847	4.6	1423	1.6	2022	5.6		
2	0304	0.2	0910	4.7	1455	1.4	2051	5.5		
3	0327	0.3	0935	4.9	1530	1.3	2126	5.3		
4	0353	0.6	1000	5.0	1606	1.2	2202	4.9		
5	0420	0.9	1032	5.0	1648	1.2	2241	4.5		
6	0449	1.3	1104	5.0	1739	1.3	2329	4.0		
7	0521	1.7	1141	5.0	1841	1.3	---	---		
8	0603	3.5	0600	4.1	1234	5.0	2003	1.3		
9	0215	3.2	0654	4.5	1345	4.9	2136	1.0		
10	0417	3.3	0634	4.7	1511	5.1	2254	0.6		
11	0531	3.7	1021	4.5	1628	5.4	2351	0.1		
12	0621	4.1	1131	4.2	1732	5.8	---	---		
13	0040	-0.3	0657	4.6	1228	1.7	1828	6.1		
14	0121	-0.5	0734	5.0	1319	1.2	1917	6.2		
15	0200	-0.5	0807	5.4	1403	0.7	2003	6.2		
16	0238	-0.4	0843	5.6	1449	0.4	2048	6.0		
17	0314	-0.1	0916	5.8	1534	0.2	2134	5.6		
18	0347	0.4	0955	5.8	1618	0.3	2220	5.1		
19	0424	0.9	1031	5.7	1707	0.5	2309	4.5		
20	0457	1.5	1104	5.4	1800	0.7	---	---		
21	0004	3.9	0536	2.0	1149	5.1	1906	1.0		
22	0127	3.4	0620	2.5	1242	4.7	2029	1.2		
23	0323	3.3	0736	2.9	1355	4.4	2158	1.2		
24	0507	3.5	0943	3.0	1524	4.4	2306	1.0		
25	0556	3.8	1101	2.8	1641	4.5	2354	0.8		
26	0632	4.1	1154	2.5	1734	4.7	---	---		
27	0032	0.6	0657	4.3	1231	2.1	1819	4.9		
28	0105	0.5	0718	4.6	1305	1.7	1856	5.1		
29	0130	0.5	0741	4.8	1337	1.3	1930	5.2		
30	0158	0.5	0802	5.1	1409	1.0	2004	5.2		

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 21
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PARI NE COAST
SEPTEMBER 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0247	0.1	0854	4.3	1433	1.5	2029	5.2		
2	0314	0.2	0917	4.4	1505	1.3	2054	5.1		
3	0337	0.3	0942	4.6	1540	1.2	2133	4.9		
4	0403	0.5	1007	4.6	1616	1.1	2209	4.6		
5	0430	0.8	1039	4.6	1658	1.1	2248	4.2		
6	0459	1.2	1111	4.6	1749	1.2	2336	3.7		
7	0531	1.5	1144	4.6	1851	1.2	---	---		
8	0043	3.3	0610	1.9	1241	4.6	2013	1.2		
9	0222	3.0	0709	2.3	1352	4.6	2146	0.9		
10	0424	3.1	0849	2.5	1518	4.7	2304	0.5		
11	0536	3.5	1031	2.4	1635	5.0	0001	0.1		
12	0628	3.8	1141	2.0	1739	5.4	---	---		
13	0050	-0.3	0704	4.3	1234	1.5	1835	5.6		
14	0131	-0.5	0741	4.6	1329	1.1	1924	5.7		
15	0210	-0.5	0814	5.0	1413	0.6	2010	5.7		
16	0248	-0.4	0850	5.2	1459	0.4	2055	5.6		
17	0324	-0.1	0925	5.4	1544	0.2	2141	5.2		
18	0357	0.4	1002	5.4	1628	0.3	2227	4.7		
19	0434	0.8	1038	5.3	1717	0.5	2316	4.2		
20	0507	1.4	1116	5.0	1810	0.6	---	---		
21	0016	3.6	0546	1.8	1156	4.7	1916	0.9		
22	0134	3.2	0630	2.4	1249	4.4	2034	1.1		
23	0330	3.1	0746	2.7	1402	4.1	2208	1.1		
24	0514	3.3	0943	2.8	1531	4.1	2316	0.9		
25	0603	3.5	1111	2.6	1648	4.2	0004	0.7		
26	0639	3.8	1204	2.3	1741	4.4	---	---		
27	0042	0.5	0704	4.0	1841	1.9	1826	4.6		
28	0115	0.5	0725	4.3	1315	1.5	1903	4.7		
29	0140	0.5	0748	4.5	1347	1.2	1937	4.8		
30	0208	0.5	0809	4.7	1419	0.9	2011	4.8		

--- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

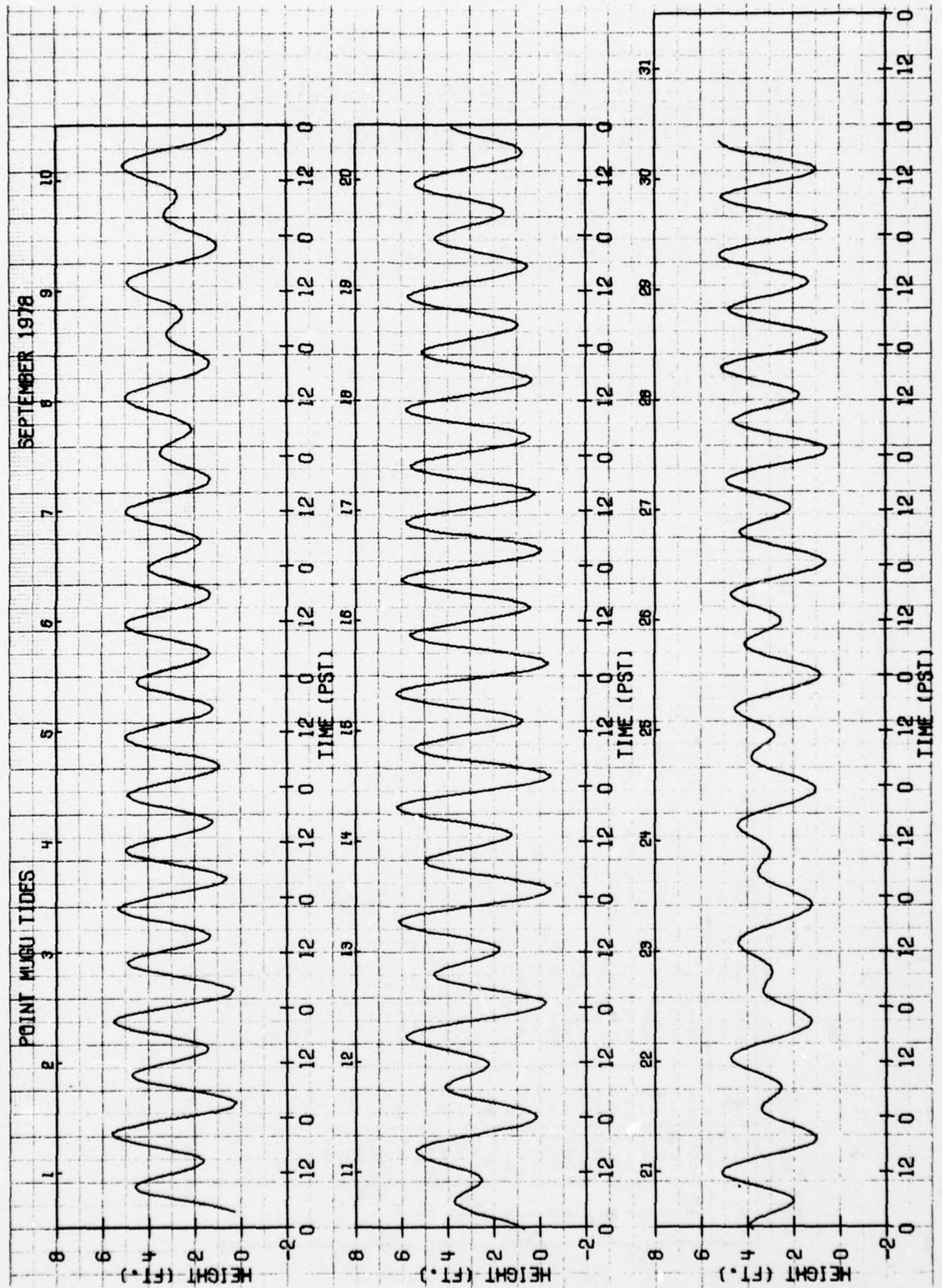


Figure 9. Tidal Graph for Point Mugu, September 1978.

TABLE 22
POINT MUGO LINES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

OCTOBER 1978

DATE	TIME PST	MGT FT	TIME PST	MGT FT	TIME PST	MGT FT	TIME PST	MGT FT
1	0223	0.0	0856	5.3	1841	0.7	2039	5.1
2	0248	0.8	0851	5.5	1515	0.5	2115	4.9
3	0313	1.0	0920	5.0	1555	0.4	2155	4.6
4	0345	1.3	0949	5.6	1636	0.3	2242	4.3
5	0419	1.7	1024	5.6	1727	0.4	2337	3.9
6	0452	2.1	1106	5.4	1827	0.5	---	---
7	0520	2.5	1159	5.2	1944	0.6	---	---
8	0557	3.4	1257	5.8	2107	0.6	---	---
9	0630	3.7	1349	5.5	2221	0.4	---	---
10	0703	4.1	1430	5.0	2322	0.6	---	---
11	0756	4.6	1513	5.2	---	---	---	---
12	0811	0.0	1631	5.1	1821	5.8	---	---
13	0852	0.0	1706	5.5	1912	5.8	---	---
14	0924	0.1	1738	5.8	1958	5.4	---	---
15	0956	0.4	1812	6.0	2044	5.2	---	---
16	1029	0.7	1844	6.1	2125	4.9	---	---
17	1101	1.1	1914	6.1	2211	4.5	---	---
18	1155	1.5	1949	5.8	2301	4.1	---	---
19	1247	2.0	2021	5.5	2357	3.7	---	---
20	1349	2.4	2057	5.1	---	---	---	---
21	1404	3.4	2131	4.7	1931	0.9	---	---
22	1455	3.4	2200	3.1	2050	1.0	---	---
23	1530	3.6	2252	3.2	2111	4.0	---	---
24	1614	3.4	2333	2.8	2258	1.0	---	---
25	1657	4.2	2410	2.5	2336	0.9	---	---
26	1741	4.5	2455	2.0	2445	4.3	---	---
27	1815	0.9	2533	4.8	2448	1.5	---	---
28	1858	0.9	2624	5.1	2500	0.9	---	---
29	1942	0.4	2723	5.5	2552	0.5	---	---
30	2030	1.0	2846	5.8	2627	0.1	---	---
31	2104	1.2	2913	6.0	2703	-0.3	---	---

AND ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 23
SAN NICOLAS ISLAND LINES
35 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

OCTOBER 1978

DATE	TIME PST	MGT FT	TIME PST	MGT FT	TIME PST	MGT FT	TIME PST	MGT FT
1	0233	0.5	0833	4.9	1451	0.6	2046	4.7
2	0258	0.7	0858	5.1	1525	0.5	2122	4.6
3	0323	0.9	0926	5.2	1605	0.4	2202	4.5
4	0355	1.2	0956	5.2	1646	0.3	2244	4.0
5	0424	1.5	1031	5.2	1737	0.4	2344	3.6
6	0502	1.9	1114	5.0	1837	0.5	---	---
7	0557	3.3	1206	4.3	1953	0.5	---	---
8	0642	3.2	1257	2.6	2064	4.8	---	---
9	0717	3.5	1349	2.6	2117	0.5	---	---
10	0750	3.8	1430	2.3	2231	0.4	---	---
11	0803	4.3	1494	1.7	2332	0.6	---	---
12	0821	0.0	1538	4.7	2401	1.2	---	---
13	0902	0.0	1613	5.1	2458	0.6	---	---
14	0934	0.1	1649	5.4	2551	0.2	---	---
15	1019	0.4	1731	5.6	2651	0.1	---	---
16	1049	0.9	1821	5.6	2733	0.3	---	---
17	1121	1.0	1921	5.6	2814	-0.2	---	---
18	1205	1.4	2050	5.4	2856	0.0	---	---
19	1247	1.8	2128	5.1	2904	0.3	---	---
20	1334	2.2	2204	4.7	2937	0.5	---	---
21	1416	3.2	2251	4.5	3041	4.4	---	---
22	1502	3.2	2350	4.9	3146	4.0	---	---
23	1537	3.6	2402	3.0	3211	3.7	---	---
24	1621	3.6	2443	2.6	3251	3.7	---	---
25	1704	3.9	2510	2.3	3346	3.8	---	---
26	1741	4.2	2555	1.8	3452	4.0	---	---
27	1825	4.4	2640	4.5	3554	1.4	---	---
28	1904	4.4	2705	4.7	3654	0.4	---	---
29	1942	4.6	2750	5.1	3754	0.4	---	---
30	2030	5.4	2853	5.8	3854	0.1	---	---
31	2114	1.1	2920	5.6	3954	-0.3	---	---

* -- THE OCCURS ON NEXT DATE.
AND ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

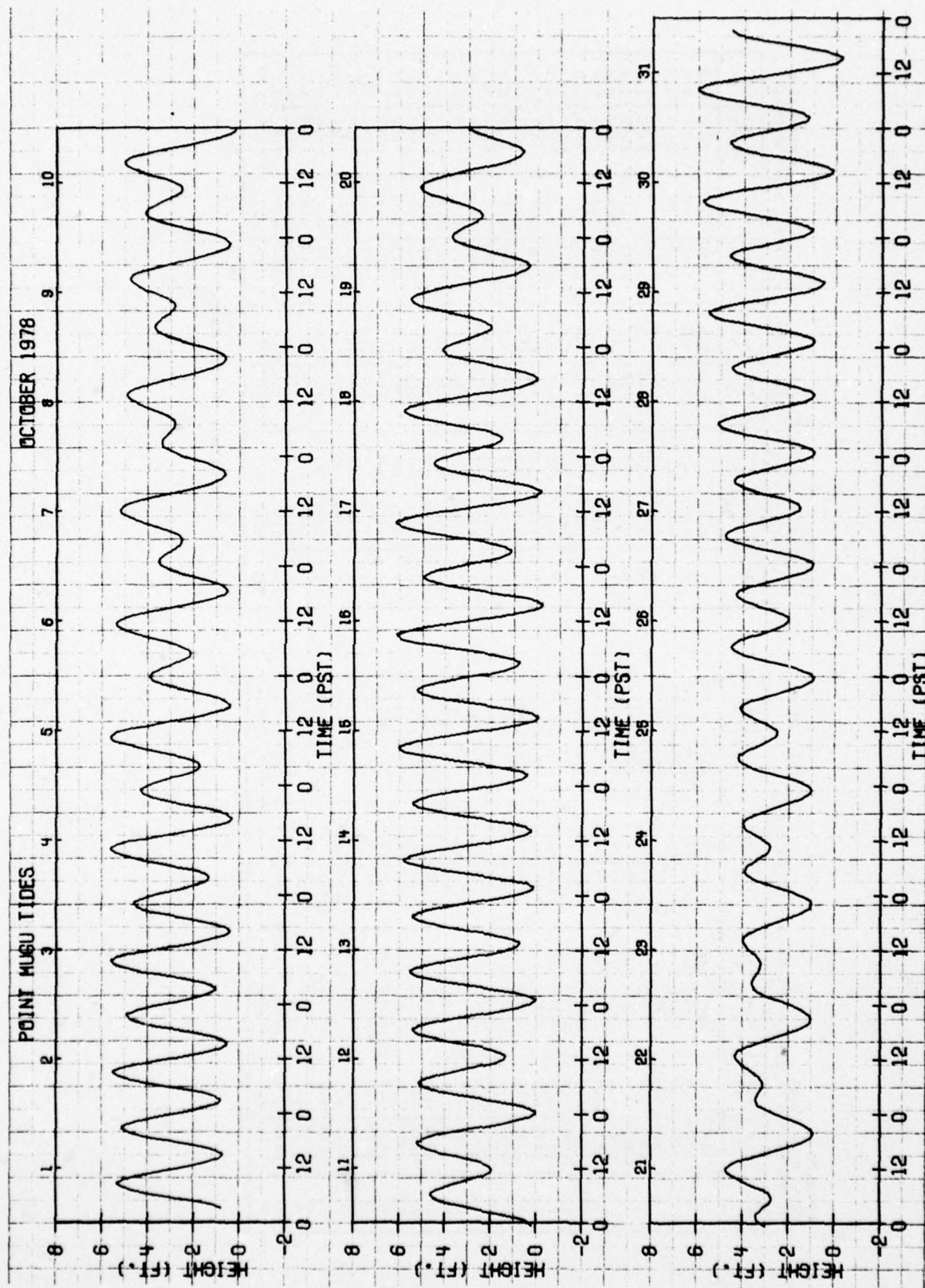


Figure 10. Tidal Graph for Point Mugu, October 1978.

TABLE 24
POINT MUGU TIDES
34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER NOVEMBER 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0241	1.4	0845	6.1	1545	-0.4	2155	4.3		
2	0313	1.6	0920	6.2	1630	-0.5	2244	4.1		
3	0351	2.0	1000	6.0	1719	-0.4	2345	3.8		
4	0434	2.3	1045	5.8	1817	-0.2	---	---		
5	0517	3.7	0536	2.6	1141	5.3	1923	0.0		
6	0620	3.8	0702	2.8	1255	4.9	2035	0.2		
7	0734	4.1	0854	2.7	1428	4.4	2144	0.3		
8	0838	4.5	1029	2.2	1559	4.4	2246	0.4		
9	0923	5.0	1135	1.5	1715	4.5	2335	0.5		
10	0951	5.4	1228	0.8	1814	4.5	---	---		
11	0020	0.8	0637	5.8	1314	0.3	1909	4.6		
12	0050	0.8	0712	6.1	1350	-0.2	1955	4.5		
13	0134	1.1	0743	6.2	1436	-0.5	2041	4.4		
14	0209	1.3	0815	6.2	1513	-0.6	2124	4.2		
15	0241	1.6	0846	6.1	1552	-0.5	2206	4.0		
16	0311	1.9	0915	5.9	1630	-0.4	2252	3.8		
17	0343	2.2	0947	5.6	1711	-0.1	2338	3.6		
18	0418	2.5	1019	5.3	1753	0.2	---	---		
19	0442	3.5	0500	4.7	1857	4.9	1843	0.5		
20	0513	3.5	0556	3.0	1139	4.4	1939	0.7		
21	0547	3.6	0739	3.1	1248	3.9	2041	1.0		
22	0607	3.9	0838	2.9	1421	3.6	2138	1.1		
23	0649	4.2	1058	2.5	1554	3.5	2230	1.2		
24	0516	4.5	1148	1.9	1707	3.6	2309	1.2		
25	0547	4.9	1226	1.3	1803	3.7	2351	1.3		
26	0613	5.3	1301	0.7	1851	3.9	---	---		
27	0626	5.3	0641	5.7	1337	0.1	1937	4.0		
28	0101	1.4	0714	6.1	1415	-0.4	2020	4.1		
29	0135	1.5	0746	6.4	1454	-0.9	2105	4.2		
30	0215	1.6	0825	6.6	1536	-1.1	2152	4.2		

TABLE 25
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST NOVEMBER 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0251	1.3	0852	5.6	1555	-0.4	2202	4.0		
2	0323	1.5	0927	5.7	1640	-0.5	2251	3.8		
3	0401	1.8	1007	5.6	1729	-0.4	2352	3.5		
4	0444	2.1	1052	5.4	1827	-0.2	---	---		
5	0510	3.5	0546	2.5	1148	4.9	1933	0.0		
6	0227	3.5	0712	2.6	1302	4.6	2045	0.2		
7	0340	3.8	0904	2.5	1435	4.1	2154	0.3		
8	0445	4.2	1039	2.0	1606	4.1	2256	0.4		
9	0530	4.6	1145	1.4	1722	4.2	2345	0.5		
10	0608	5.0	1238	0.7	1821	4.2	---	---		
11	0630	0.5	0644	5.4	1324	0.3	1916	4.3		
12	0108	0.7	0719	5.6	1406	-0.2	2002	4.2		
13	0144	1.0	0750	5.7	1446	-0.5	2046	4.1		
14	0219	1.2	0822	5.7	1523	-0.5	2131	3.9		
15	0251	1.5	0853	5.6	1602	-0.5	2213	3.7		
16	0321	1.7	0922	5.5	1640	-0.4	2259	3.5		
17	0353	2.0	0954	5.2	1721	-0.1	2345	3.4		
18	0426	2.4	1026	4.9	1803	0.2	---	---		
19	0449	3.3	0510	2.5	1104	4.6	1853	0.5		
20	0500	3.3	0606	2.8	1146	4.1	1949	0.6		
21	0321	3.4	0749	2.9	1255	3.6	2051	0.9		
22	0414	3.6	0948	2.7	1424	3.4	2148	1.0		
23	0450	3.9	1104	2.3	1601	3.3	2240	1.1		
24	0525	4.2	1158	1.7	1714	3.4	2319	1.1		
25	0554	4.6	1236	1.2	1810	3.5	0001	1.2		
26	0620	4.9	1311	0.6	1854	3.6	---	---		
27	0036	1.2	0644	5.3	1347	0.1	1944	3.7		
28	0111	1.3	0721	5.6	1425	-0.4	2027	3.6		
29	0145	1.4	0753	5.9	1504	-0.4	2112	3.9		
30	0225	1.5	0832	6.1	1546	-1.0	2159	3.9		

* --- TIDE OCCURS ON NEXT DATE.

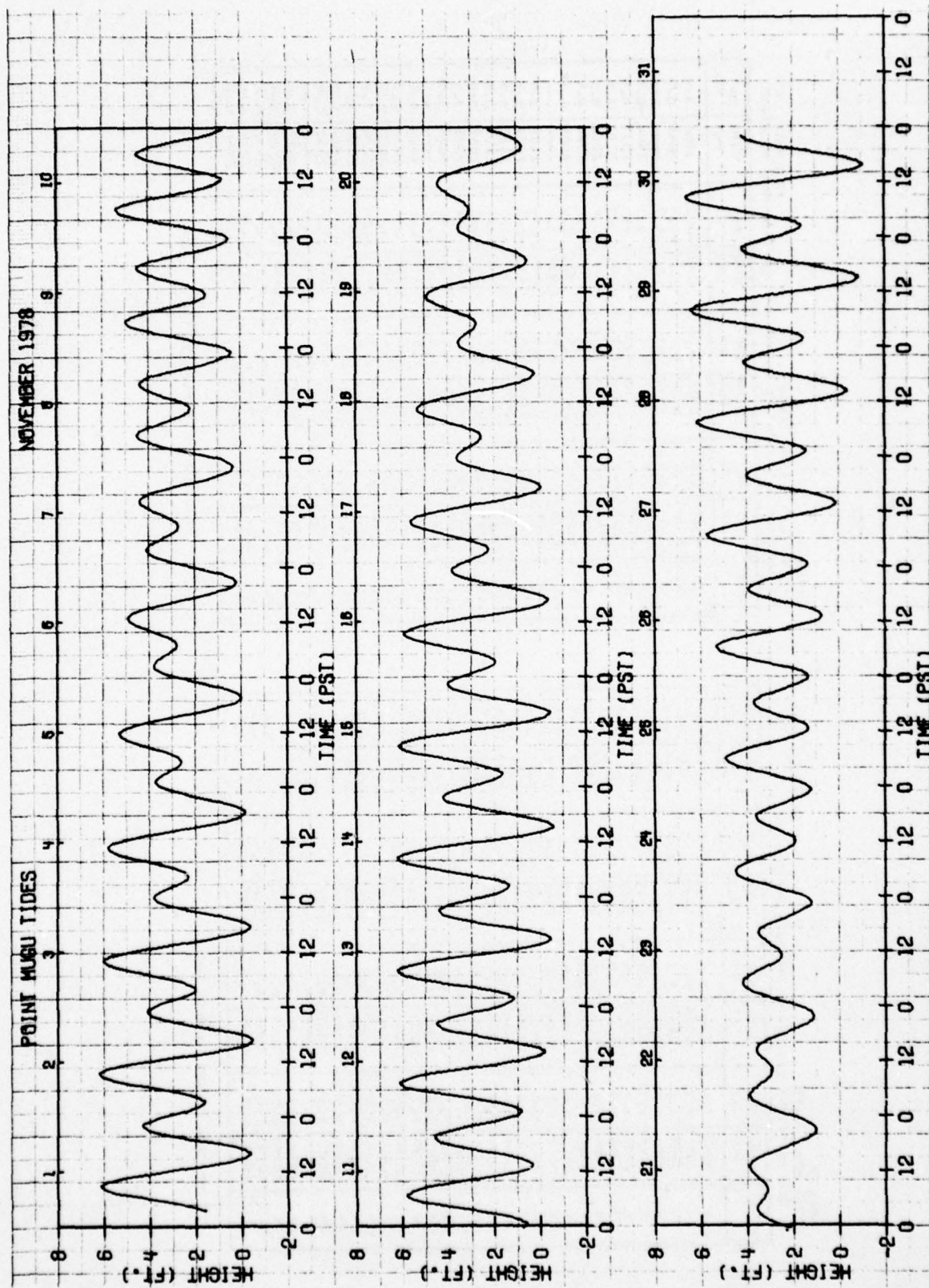


Figure 11. Tidal Graph for Point Mugu, November 1978.

TABLE 26
POINT MUGU TIDES

33 DEG 06 MIN N 114 DEG 06 MIN W - OCEAN PIER

DECEMBER 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0257	1.8	0903	6.6	1620	-1.2	2244	4.1
2	0341	2.0	0948	6.4	1708	-1.0	2338	4.1
3	0435	2.2	1037	6.0	1801	-0.8	---	---
4	0517	2.4	1124	5.5	1858	-0.4	1957	0.0
5	0601	2.6	1212	4.8	1957	0.0	2101	0.4
6	0657	2.8	1300	4.2	2053	0.7	2203	1.0
7	0756	3.0	1350	3.6	2150	1.2	2301	1.2
8	0856	3.2	1440	3.0	2248	1.5	2399	1.5
9	0956	3.4	1530	2.4	2346	1.8	---	---
10	1056	3.6	1620	1.8	2444	2.1	1959	3.9
11	1156	3.8	1710	1.2	2542	2.4	2044	3.9
12	1256	4.0	1800	0.6	2640	2.7	2120	3.9
13	0147	1.8	0754	6.2	1506	-0.7	2200	3.8
14	0219	1.9	0825	6.1	1540	-0.7	2240	3.8
15	0254	2.1	0856	5.9	1615	-0.6	2319	3.7
16	0326	2.2	0928	5.7	1647	-0.4	0001	3.7*
17	0358	2.4	0957	5.4	1724	-0.1	---	---
18	0440	2.5	1031	5.0	1801	0.2	---	---
19	0529	2.7	1104	4.5	1841	0.5	1841	0.5
20	0637	2.8	1154	4.0	1922	0.8	1922	0.8
21	0738	2.9	1244	3.5	2004	1.1	2004	1.1
22	0837	3.1	1334	3.0	2086	1.4	2086	1.4
23	0937	3.3	1424	2.5	2168	1.7	2168	1.7
24	1037	3.5	1514	2.0	2250	2.0	2250	2.0
25	1137	3.7	1604	1.5	2332	2.3	2332	2.3
26	1237	3.9	1694	1.0	2414	2.6	2414	2.6
27	0137	1.7	0744	6.2	1403	-0.8	2015	3.9
28	0214	1.7	0728	6.6	1442	-1.2	2057	4.1
29	0246	1.6	0809	6.8	1524	-1.5	2143	4.2
30	0318	1.6	0854	6.8	1606	-1.5	2227	4.3
31	0338	1.6	0939	6.6	1652	-1.4	2317	4.4

* -- TIDE OCCURS ON NEXT DATE.

TABLE 27

SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N 114 DEG 30 MIN W - CENTRAL PART NE COAST

DECEMBER 1978

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0307	1.6	0910	6.1	1630	-1.1	2251	3.8
2	0351	1.8	0955	5.9	1718	-0.9	2345	3.8
3	0445	2.0	1044	5.6	1811	-0.7	---	---
4	0540	2.2	1134	5.2	1908	-0.4	1908	-0.4
5	0634	2.4	1224	4.8	2007	0.0	2007	0.0
6	0728	2.6	1314	4.4	2107	0.4	2107	0.4
7	0822	2.8	1404	4.0	2207	0.8	2207	0.8
8	0916	3.0	1494	3.6	2307	1.2	2307	1.2
9	1010	3.2	1584	3.2	2407	1.6	2407	1.6
10	1104	3.4	1674	2.8	2507	2.0	2507	2.0
11	1158	3.6	1764	2.4	2607	2.4	2607	2.4
12	1252	3.8	1854	2.0	2707	2.8	2707	2.8
13	0146	1.8	0754	6.2	1404	-0.4	2006	3.6
14	0229	1.7	0832	5.6	1442	-0.5	2051	3.6
15	0304	1.9	0903	5.5	1516	-0.6	2127	3.6
16	0336	2.0	0935	5.3	1550	-0.6	2207	3.5
17	0408	2.2	1004	5.0	1625	-0.5	2247	3.5
18	0450	2.4	1038	4.6	1657	-0.4	2326	3.5
19	0534	2.5	1117	4.2	1734	-0.1	0008	3.5*
20	0617	2.6	1201	3.7	1811	0.2	---	---
21	0701	2.7	1289	3.3	1851	0.5	1851	0.5
22	0745	2.8	1377	2.9	1932	0.7	1932	0.7
23	0829	3.0	1465	2.5	2014	1.0	2014	1.0
24	0913	3.2	1553	2.1	2104	1.3	2104	1.3
25	1007	3.4	1641	1.7	2194	1.6	2194	1.6
26	1101	3.6	1729	1.3	2284	1.9	2284	1.9
27	1155	3.8	1817	0.9	2374	2.2	2374	2.2
28	1249	4.0	1905	0.5	2464	2.5	2464	2.5
29	0143	1.8	0753	6.1	1452	-1.1	2104	3.6
30	0227	1.7	0831	5.5	1534	-1.4	2150	3.9
31	0311	1.7	0909	5.1	1616	-1.4	2234	4.0

* -- TIDE OCCURS ON NEXT DATE.

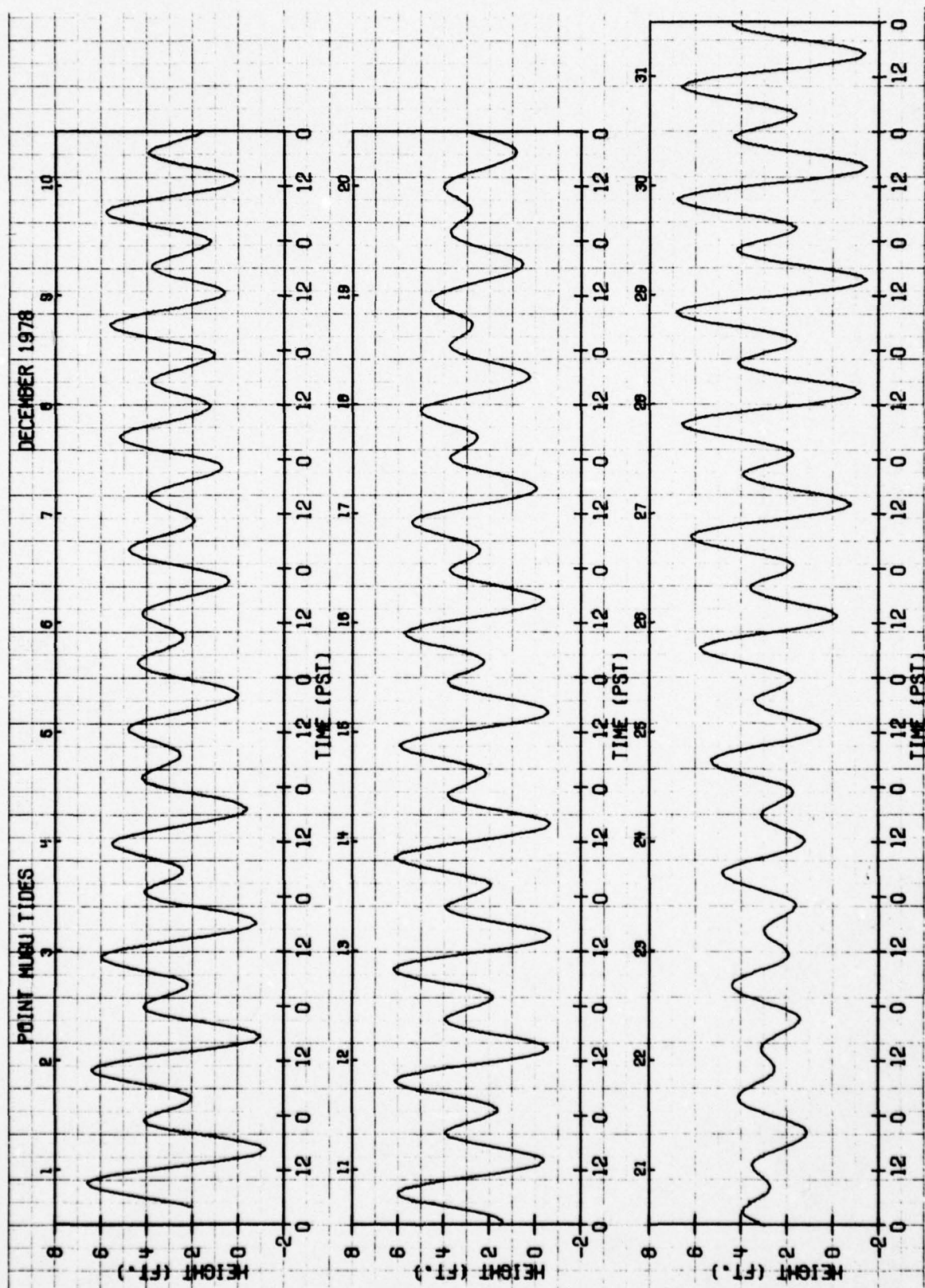


Figure 12. Tidal Graph for Point Mugu, December 1978.

Table 28. Moonrise and Moonset, Barking Sands, Hawaii, 1978

Date	January		February		March		April		May		June		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	0000	1205	0126	1301	0019	1150	0205	1336	0228	1428	0314	1604	1
2	0040	1246	0226	1355	0119	1244	0256	1436	0311	1525	0355	1657	2
3	0137	1330	0327	1452	0217	1342	0344	1536	0353	1620	0437	1749	3
4	0236	1417	0427	1553	0315	1442	0429	1635	0433	1715	0520	1840	4
5	0338	1510	0526	1656	0410	1544	0513	1732	0514	1809	0605	1930	5
6	0441	1608	0621	1801	0501	1646	0554	1828	0556	1902	0652	2018	6
7	0545	1710	0712	1904	0550	1747	0636	1923	0639	1955	0739	2104	7
8	0646	1814	0800	2004	0635	1846	0718	2018	0723	2046	0829	2148	8
9	0744	1919	0845	2103	0719	1944	0800	2111	0809	2135	0918	2230	9
10	0838	2023	0928	2200	0801	2041	0844	2203	0856	2223	1008	2310	10
11	0927	2124	1009	2255	0843	2136	0929	2253	0945	2308	1058	2349	11
12	1012	2223	1050	2348	0925	2230	1016	2342	1034	2351	1148	---	12
13	1054	2319	1131	---	1008	2322	1103	---	1124	---	1240	0027	13
14	1135	---	1214	0040	1051	---	1152	0028	1214	0032	1333	0105	14
15	1214	0013	1258	0131	1136	0012	1241	0113	1305	0112	1428	0145	15
16	1254	0106	1343	0221	1223	0102	1332	0155	1356	0151	1526	0227	16
17	1335	0157	1430	0309	1311	0149	1423	0236	1450	0230	1626	0313	17
18	1417	0248	1519	0356	1400	0234	1515	0316	1546	0310	1728	0403	18
19	1501	0338	1608	0441	1451	0318	1609	0356	1643	0352	1832	0458	19
20	1548	0427	1659	0524	1542	0400	1704	0436	1744	0437	1935	0558	20
21	1635	0514	1751	0606	1635	0441	1801	0518	1846	0526	2035	0701	21
22	1724	0600	1844	0646	1728	0522	1901	0601	1949	0619	2131	0806	22
23	1815	0645	1937	0726	1822	0602	2002	0648	2052	0716	2222	0911	23
24	1906	0727	2031	0806	1918	0642	2103	0738	2152	0817	2309	1013	24
25	1958	0808	2127	0846	2015	0725	2205	0832	2248	0920	2353	1113	25
26	2050	0848	2223	0928	2113	0809	2304	0930	2340	1022	---	1211	26
27	2142	0927	2320	1012	2213	0856	---	1029	---	1124	0034	1306	27
28	2236	1006	---	1059	2314	0946	0001	1130	0027	1223	0115	1400	28
29	2331	1046	---	---	---	1040	0054	1231	0112	1320	0156	1453	29
30	---	1128	---	---	0013	1137	0143	1330	0153	1416	0236	1545	30
31	0027	1213	---	---	0110	1236	---	---	0234	1511	---	---	31

Date	July		August		September		October		November		December		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	0319	1637	0422	1745	0536	1828	0604	1822	0737	1913	0824	1948	1
2	0403	1727	0511	1829	0627	1907	0657	1903	0837	2005	0923	2050	2
3	0449	1816	0600	1910	0718	1945	0752	1945	0937	2101	1020	2153	3
4	0536	1902	0650	1950	0810	2024	0849	2031	1035	2159	1112	2254	4
5	0625	1947	0741	2029	0904	2104	0947	2119	1132	2300	1200	2355	5
6	0714	2030	0831	2107	0958	2147	1045	2211	1225	---	1245	---	6
7	0804	2110	0922	2144	1054	2233	1143	2307	1314	0001	1329	0054	7
8	0854	2149	1014	2223	1151	2322	1240	---	1401	0101	1410	0151	8
9	0944	2227	1107	2304	1250	---	1335	0005	1445	0200	1451	0247	9
10	1035	2305	1202	2347	1348	0015	1427	0106	1527	0258	1533	0342	10
11	1126	2344	1259	---	1445	0112	1516	0206	1609	0356	1617	0436	11
12	1218	---	1358	0035	1541	0213	1603	0307	1652	0452	1702	0530	12
13	1313	0023	1458	0127	1634	0315	1648	0407	1736	0548	1748	0623	13
14	1410	0105	1558	0223	1724	0418	1731	0507	1821	0644	1836	0715	14
15	1510	0152	1657	0324	1811	0521	1815	0606	1907	0738	1926	0804	15
16	1612	0243	1753	0428	1856	0622	1858	0704	1955	0831	2015	0850	16
17	1715	0339	1846	0533	1940	0723	1943	0800	2043	0921	2105	0934	17
18	1816	0440	1935	0637	2023	0822	2029	0856	2133	1009	2154	1016	18
19	1915	0544	2022	0740	2107	0919	2115	0949	2222	1055	2244	1055	19
20	2009	0649	2106	0841	2152	1014	2203	1041	2311	1138	2334	1132	20
21	2100	0754	2119	0940	2237	1108	2252	1130	---	1218	---	1210	21
22	2146	0858	2232	1037	2324	1200	2341	1216	0001	1257	0024	1247	22
23	2231	0959	2315	1132	---	1250	---	1300	0052	1335	0115	1325	23
24	2313	1057	2358	1226	0011	1337	0031	1342	0142	1413	0208	1406	24
25	2354	1153	---	1318	0100	1422	0121	1422	0233	1451	0303	1450	25
26	---	1248	0043	1408	0149	1505	0211	1501	0327	1532	0401	1538	26
27	0036	1341	0130	1456	0239	1546	0301	1539	0423	1615	0502	1631	27
28	0119	1433	0218	1542	0329	1626	0353	1618	0521	1702	0604	1729	28
29	0202	1523	0306	1626	0420	1705	0446	1657	0621	1753	0706	1831	29
30	0247	1613	0356	1708	0511	1743	0541	1740	0722	1849	0806	1935	30
31	0334	1700	0446	1749	---	---	0638	1825	---	---	0902	2040	31

TABLE 29
PORT ALLEN TIDES
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE HAY JANUARY 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0153	0.6	0752	1.3	1520	0.0	2204	1.1
2	0342	0.6	0848	1.1	1605	0.0	2312	1.4
3	0535	0.6	0957	0.9	1653	-0.1	----	---
4	0007	1.6	0658	0.5	1110	0.8	1739	-0.2
5	0058	1.8	0803	0.4	1215	0.7	1828	-0.3
6	0140	2.0	0856	0.2	1319	0.7	1916	-0.3
7	0225	2.2	0944	0.1	1414	0.7	2001	-0.3
8	0308	2.3	1026	0.0	1506	0.7	2047	-0.3
9	0350	2.3	1108	0.0	1557	0.7	2132	-0.2
10	0432	2.2	1150	-0.1	1650	0.8	2221	-0.1
11	0511	2.0	1230	-0.1	1745	0.8	2310	0.1
12	0553	1.8	1310	0.0	1846	0.9	----	---
13	0005	0.3	0635	1.6	1352	0.0	1956	0.9
14	0112	0.5	0714	1.4	1436	0.0	2115	1.1
15	0242	0.6	0800	1.1	1520	0.0	2231	1.2
16	0440	0.6	0855	0.9	1608	0.0	----	---
17	2334	1.4*	0626	0.6	1004	0.7	1656	0.0
18	0025	1.6	0742	0.5	1117	0.6	1743	0.0
19	0106	1.7	0831	0.4	1221	0.6	1824	-0.1
20	0145	1.7	0906	0.3	1313	0.6	1906	-0.1
21	0217	1.8	0938	0.3	1356	0.6	1941	-0.1
22	0249	1.9	1003	0.2	1436	0.6	2017	-0.1
23	0319	1.9	1035	0.1	1513	0.7	2052	-0.1
24	0349	1.9	1100	0.1	1549	0.7	2127	0.0
25	0418	1.8	1128	0.1	1627	0.8	2202	0.0
26	0446	1.7	1154	0.1	1709	0.8	2244	0.1
27	0517	1.7	1226	0.0	1758	0.9	2330	0.3
28	0549	1.5	1258	0.0	1857	1.0	----	---
29	0026	0.4	0625	1.3	1336	0.0	2006	1.1
30	0147	0.6	0710	1.1	1418	0.0	2122	1.3
31	0336	0.6	0803	0.9	1512	0.0	2237	1.5

* -- TIDE OCCURS ON PREVIOUS DATE.

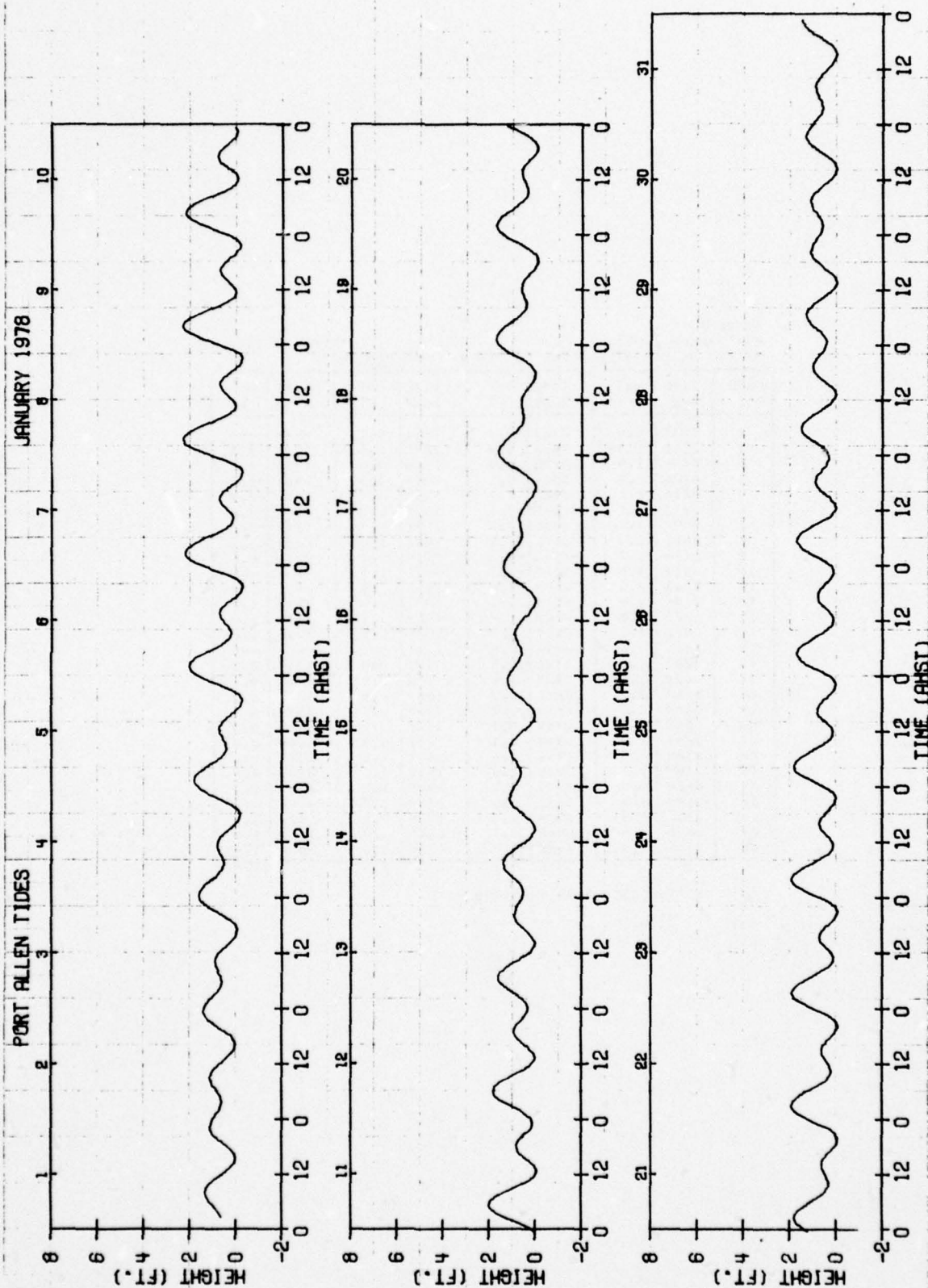


Figure 13. Tidal Graph for Port Allen, January 1978.

TABLE 30

PORT ALLEN TIDES

FEBRUARY 1976

21 DEG 54 MIN N • 159 DEG 35 MIN W - HANAPEPE HAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0537	0.6	0925	0.7	1611	-0.1	----	---
2	2340	1.7*	0658	0.4	1058	0.6	1711	-0.1
3	0034	1.8	0758	0.3	1210	0.6	1812	-0.2
4	0124	2.0	0844	0.1	1316	0.7	1905	-0.2
5	0210	2.1	0922	0.0	1410	0.7	1956	-0.3
6	0251	2.1	1001	-0.1	1501	0.8	2045	-0.2
7	0332	2.1	1036	-0.1	1547	0.9	2134	-0.2
8	0411	1.9	1112	-0.1	1633	1.0	2220	-0.1
9	0446	1.7	1145	-0.1	1719	1.1	2308	0.1
10	0522	1.6	1217	-0.1	1811	1.1	----	---
11	0001	0.3	0559	1.4	1251	0.0	1907	1.2
12	0102	0.5	0633	1.1	1327	0.0	2013	1.2
13	0223	0.6	0710	0.9	1412	0.1	2128	1.3
14	0411	0.6	0802	0.7	1502	0.1	2238	1.4
15	0610	0.6	0925	0.6	1601	0.1	----	---
16	2343	1.5*	0720	0.5	1101	0.6	1659	0.1
17	0031	1.6	0758	0.4	1210	0.6	1759	0.1
18	0113	1.7	0830	0.3	1301	0.6	1847	0.0
19	0148	1.7	0859	0.2	1345	0.7	1929	0.0
20	0222	1.7	0924	0.1	1422	0.8	2008	0.0
21	0251	1.7	0949	0.1	1457	0.9	2046	0.0
22	0320	1.7	1014	0.0	1533	1.0	2125	0.0
23	0349	1.7	1039	0.0	1611	1.1	2204	0.0
24	0420	1.6	1103	0.0	1649	1.2	2247	0.1
25	0449	1.5	1132	0.0	1732	1.2	----	---
26	2337	0.3*	0524	1.3	1206	0.0	1827	1.3
27	0038	0.4	0602	1.1	1240	0.0	1927	1.4
28	0157	0.5	0645	0.9	1325	0.0	2039	1.4

* -- TIDE OCCURS ON PREVIOUS DATE.

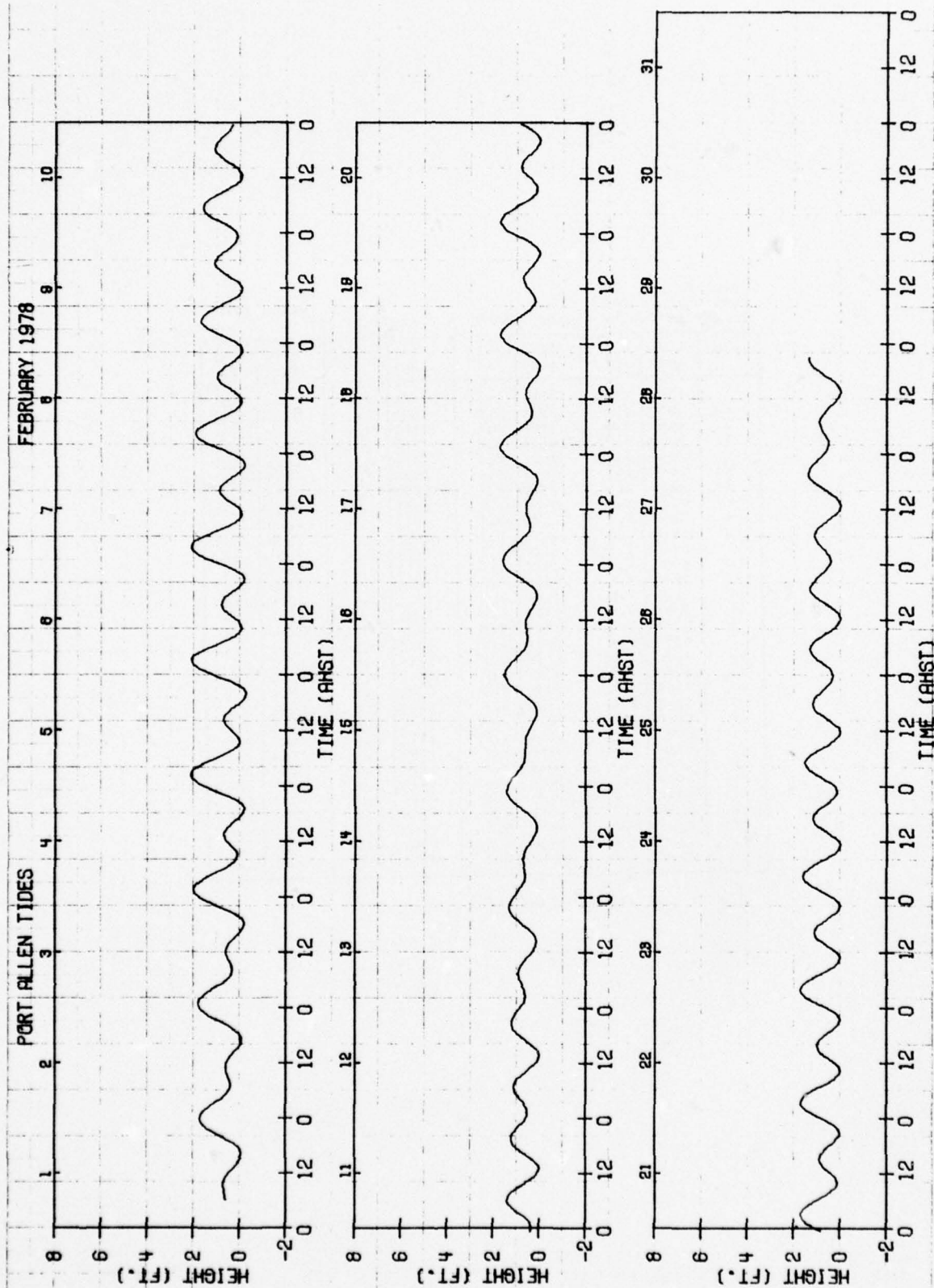


Figure 14. Tidal Graph for Port Allen, February 1978.

TABLE 31
 PORT ALLEN TIDES
 21 DEG 54 MIN N, 154 DEG 35 MIN W - HANAPEPE HAY MARCH 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0342	0.5	0750	0.7	1424	0.0	2158	1.6
2	0535	0.5	0926	0.6	1536	0.0	2309	1.7
3	0644	0.3	1106	0.6	1651	0.0	----	----
4	0009	1.7	0733	0.2	1221	0.7	1800	0.0
5	0100	1.8	0814	0.0	1319	0.8	1905	-0.1
6	0146	1.8	0850	0.0	1407	0.9	1958	-0.1
7	0228	1.8	0922	-0.1	1450	1.1	2046	-0.1
8	0307	1.7	0954	-0.1	1533	1.2	2135	-0.1
9	0346	1.7	1025	-0.1	1611	1.3	2220	0.0
10	0418	1.5	1052	-0.1	1653	1.4	2308	0.1
11	0452	1.3	1121	-0.1	1739	1.4	----	----
12	0000	0.3	0527	1.1	1150	0.0	1826	1.4
13	0056	0.4	0556	0.9	1225	0.1	1918	1.4
14	0209	0.5	0634	0.7	1301	0.1	2019	1.4
15	0344	0.5	0733	0.6	1354	0.2	2131	1.4
16	0525	0.5	0909	0.6	1501	0.2	2240	1.4
17	0627	0.4	1051	0.6	1620	0.3	----	----
18	2338	1.5*	0708	0.3	1159	0.6	1727	0.2
19	0026	1.5	0740	0.2	1248	0.7	1826	0.2
20	0105	1.6	0808	0.1	1328	0.9	1914	0.1
21	0143	1.6	0835	0.1	1403	1.0	1959	0.1
22	0215	1.6	0859	0.0	1439	1.2	2041	0.0
23	0247	1.5	0921	0.0	1513	1.3	2123	0.0
24	0319	1.4	0947	-0.1	1549	1.4	2209	0.1
25	0351	1.3	1015	-0.1	1628	1.5	2256	0.1
26	0426	1.2	1045	-0.1	1713	1.6	----	----
27	2352	0.2*	0505	1.0	1117	-0.1	1802	1.6
28	0054	0.3	0547	0.8	1156	-0.1	1901	1.6
29	0214	0.3	0643	0.7	1246	0.0	2007	1.6
30	0346	0.3	0805	0.6	1346	0.1	2119	1.6
31	0509	0.2	0951	0.6	1512	0.2	2233	1.7

* -- TIDE OCCURS ON PREVIOUS DATE.

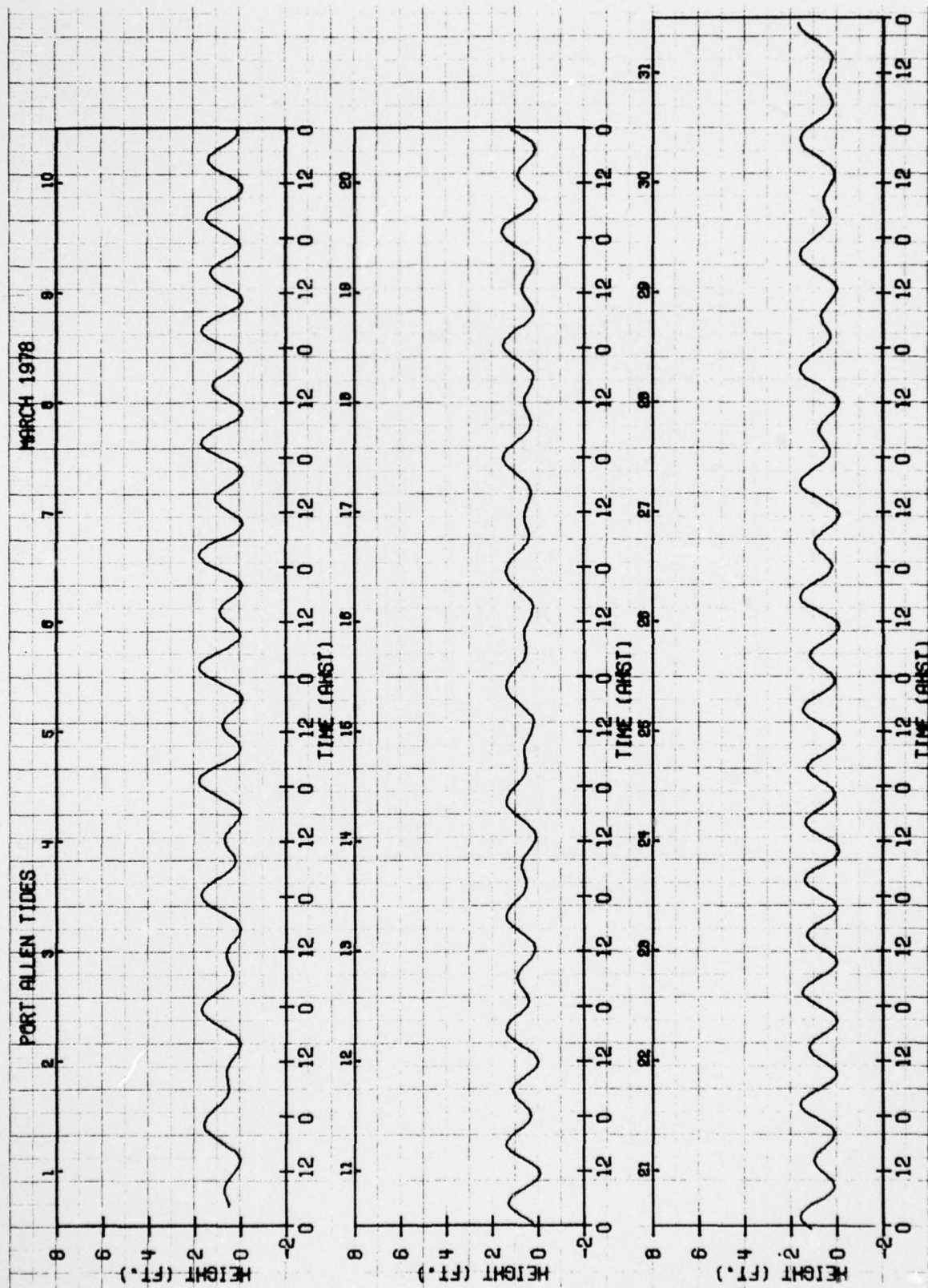


Figure 15. Tidal Graph for Port Allen, March 1978.

TABLE 32
PORT ALLEN TIDES APRIL 1978
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE HAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0610	0.1	1120	0.6	1638	0.2	----	---
2	2336	1.7*	0656	0.0	1226	0.8	1758	0.2
3	0031	1.7	0735	0.0	1314	1.0	1903	0.1
4	0116	1.6	0809	-0.1	1358	1.2	1959	0.1
5	0158	1.5	0839	-0.1	1439	1.4	2051	0.1
6	0240	1.4	0908	-0.1	1516	1.5	2138	0.1
7	0316	1.3	0935	-0.1	1555	1.6	2226	0.1
8	0348	1.1	1001	-0.1	1631	1.6	2313	0.2
9	0423	0.9	1028	-0.1	1709	1.6	----	---
10	2359	0.2*	0455	0.8	1054	0.0	1749	1.6
11	0054	0.3	0533	0.7	1126	0.1	1834	1.6
12	0200	0.4	0619	0.6	1203	0.2	1926	1.5
13	0313	0.4	0726	0.6	1250	0.3	2025	1.4
14	0424	0.3	0803	0.6	1358	0.3	2129	1.4
15	0523	0.3	1035	0.6	1527	0.4	2231	1.4
16	0605	0.2	1142	0.7	1653	0.4	----	---
17	2326	1.4*	0641	0.1	1227	0.9	1759	0.3
18	0012	1.4	0710	0.0	1306	1.1	1858	0.3
19	0054	1.3	0735	0.0	1341	1.3	1950	0.2
20	0133	1.3	0804	-0.1	1418	1.5	2040	0.1
21	0211	1.2	0831	-0.2	1454	1.6	2127	0.1
22	0247	1.1	0900	-0.2	1533	1.7	2216	0.1
23	0325	1.0	0932	-0.2	1614	1.8	2308	0.1
24	0407	0.9	1004	-0.2	1657	1.8	----	---
25	0003	0.1	0449	0.7	1044	-0.2	1745	1.8
26	0106	0.1	0545	0.6	1126	-0.1	1839	1.8
27	0215	0.1	0654	0.6	1218	0.1	1939	1.7
28	0325	0.1	0823	0.6	1324	0.2	2045	1.7
29	0437	0.1	1002	0.6	1454	0.3	2151	1.6
30	0526	0.0	1121	0.8	1634	0.4	2256	1.5

* -- TIDE OCCURS ON PREVIOUS DATE.

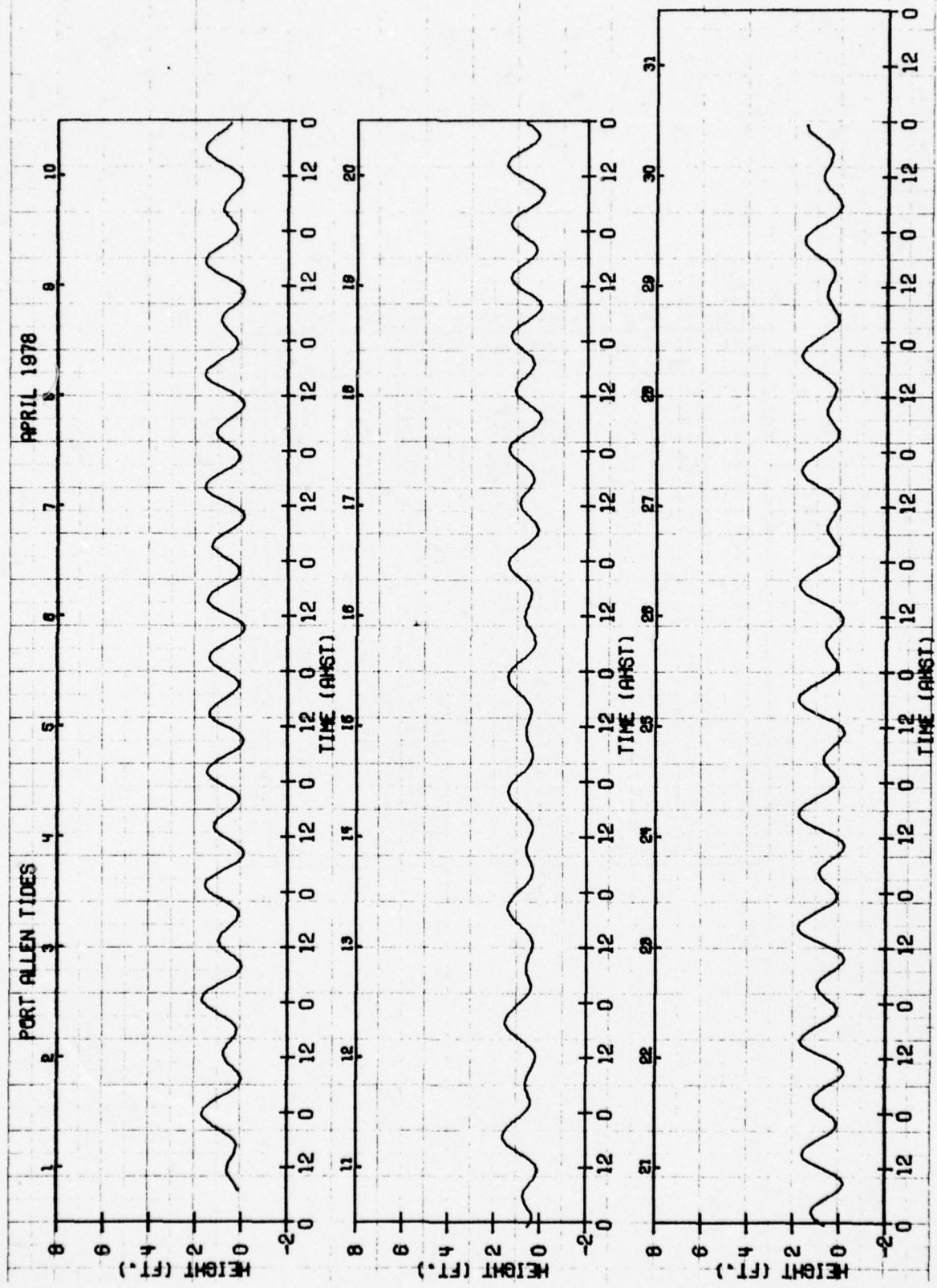


Figure 16. Tidal Graph for Port Allen, April 1978.

TABLE 33
PORT ALLEN TIDES
21 DEG 54 MIN N - 159 DEG 35 MIN W - HANAPEPE BAY MAY 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0612	-0.1	1219	1.0	1756	0.4	----	---
2	2352	1.4*	0649	-0.1	1306	1.2	1908	0.3
3	0040	1.3	0721	-0.2	1348	1.5	2006	0.3
4	0126	1.1	0753	-0.2	1423	1.6	2058	0.2
5	0208	1.0	0822	-0.2	1501	1.7	2147	0.2
6	0244	0.9	0848	-0.2	1534	1.7	2233	0.2
7	0319	0.8	0915	-0.1	1609	1.7	2318	0.2
8	0354	0.7	0943	-0.1	1644	1.7	----	---
9	0000	0.2	0932	0.6	1010	0.0	1720	1.7
10	0052	0.2	0513	0.6	1042	0.1	1801	1.7
11	0138	0.2	0606	0.6	1117	0.2	1843	1.7
12	0237	0.2	0715	0.6	1203	0.3	1931	1.6
13	0329	0.2	0840	0.6	1302	0.4	2022	1.5
14	0418	0.1	1004	0.6	1431	0.5	2119	1.4
15	0500	0.1	1109	0.6	1608	0.6	2217	1.3
16	0535	0.0	1157	1.0	1735	0.5	2309	1.2
17	0610	-0.1	1239	1.2	1844	0.4	----	---
18	0001	1.1	0641	-0.1	1319	1.5	1944	0.3
19	0047	1.0	0713	-0.2	1358	1.7	2038	0.2
20	0133	0.9	0745	-0.3	1436	1.8	2132	0.1
21	0218	0.8	0822	-0.3	1515	2.0	2223	0.1
22	0303	0.7	0857	-0.3	1559	2.1	2316	0.0
23	0352	0.7	0936	-0.3	1644	2.1	----	---
24	0008	0.0	0444	0.6	1019	-0.2	1731	2.0
25	0104	0.0	0545	0.6	1105	-0.1	1820	1.9
26	0200	0.0	0657	0.6	1203	0.1	1913	1.8
27	0258	0.0	0827	0.6	1312	0.3	2010	1.7
28	0351	-0.1	0955	0.8	1442	0.5	2108	1.5
29	0440	-0.1	1106	1.0	1624	0.6	2210	1.3
30	0522	-0.1	1202	1.2	1756	0.5	2309	1.1
31	0602	-0.2	1250	1.5	1912	0.5	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

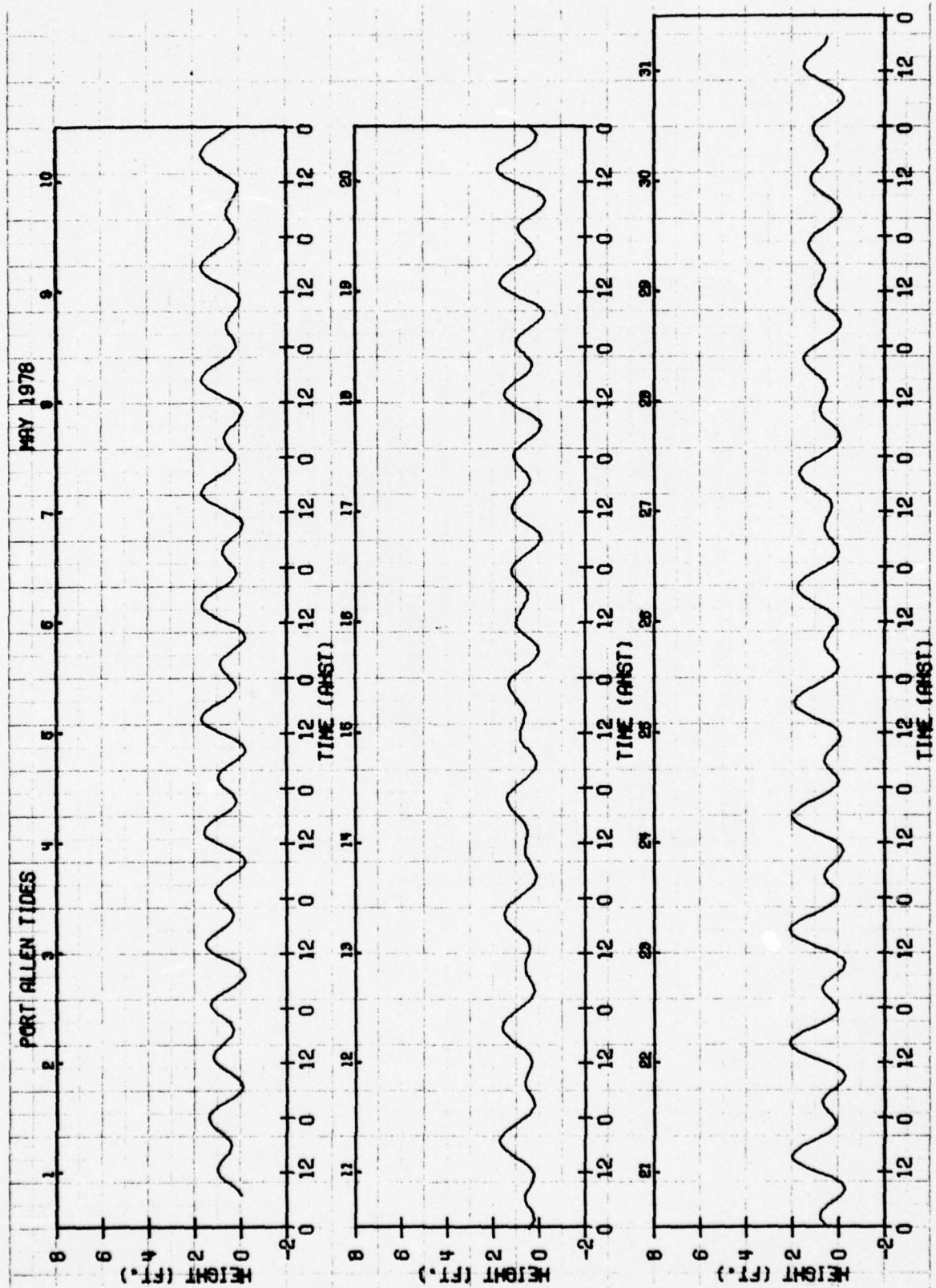


Figure 17. Tidal Graph for Port Allen, May 1978.

TABLE 34
PORT ALLEN TIDES
21 DEG 54 MIN N 159 DEG 35 MIN W - MANAPEPE BAY JUNE 1978

DATE	TIME AMST	HGT FT	TIME AMST	HGT FT	TIME AMST	HGT FT	TIME AMST	HGT FT
1	0001	1.0	0636	-0.2	1332	1.6	2015	0.4
2	0050	0.8	0709	-0.2	1411	1.7	2110	0.3
3	0132	0.7	0740	-0.2	1443	1.8	2156	0.3
4	0214	0.7	0809	-0.2	1518	1.9	2238	0.2
5	0256	0.6	0841	-0.1	1550	1.9	2316	0.2
6	0332	0.6	0909	-0.1	1625	1.9	---	---
7	0352	0.2*	0912	0.6	0941	0.0	1658	1.0
8	0030	0.2	0959	0.6	1011	0.1	1731	1.8
9	0112	0.2	0944	0.6	1052	0.2	1809	1.7
10	0151	0.1	0648	0.6	1134	0.3	1848	1.7
11	0236	0.1	0758	0.6	1230	0.4	1930	1.5
12	0315	0.1	0918	0.7	1347	0.6	2016	1.4
13	0354	0.0	1026	0.9	1528	0.6	2107	1.2
14	0434	0.0	1122	1.2	1709	0.6	2207	1.1
15	0511	-0.1	1208	1.4	1834	0.6	2309	0.9
16	0551	-0.2	1253	1.7	1942	0.4	---	---
17	0005	0.8	0629	-0.2	1337	1.8	2034	0.3
18	0103	0.8	0708	-0.3	1417	2.0	2130	0.2
19	0155	0.7	0751	-0.3	1502	2.2	2219	0.1
20	0249	0.7	0836	-0.3	1545	2.2	2304	0.0
21	0343	0.6	0921	-0.3	1628	2.2	---	---
22	0353	0.0*	0439	0.6	1007	-0.2	1713	2.1
23	0041	0.0	0539	0.7	1059	0.0	1756	2.0
24	0131	0.0	0646	0.7	1154	0.2	1844	1.8
25	0216	0.0	0800	0.8	1304	0.4	1933	1.6
26	0302	-0.1	0921	1.0	1429	0.6	2025	1.4
27	0349	-0.1	1037	1.2	1614	0.6	2121	1.1
28	0434	-0.1	1138	1.4	1756	0.6	2221	0.9
29	0516	-0.1	1228	1.6	1920	0.6	---	---
30	0322	0.8*	0554	-0.1	1313	1.7	2023	0.5

* -- TIDE OCCURS ON PREVIOUS DATE.

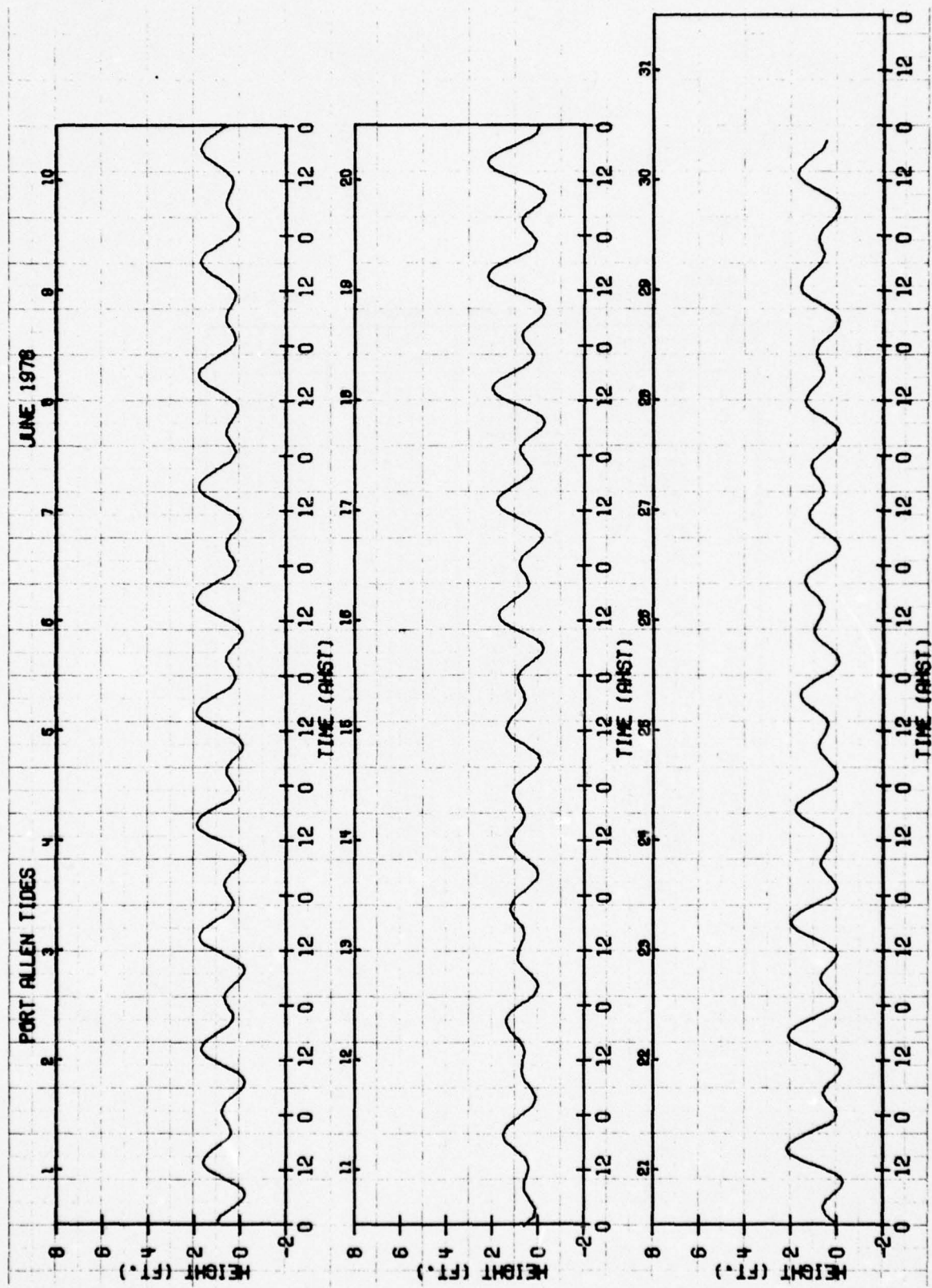


Figure 18. Tidal Graph for Port Allen, June 1978.

TABLE 35
PORT ALLEN TIDES
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE HAY JULY 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0021	0.7	0634	-0.1	1351	1.8	2108	0.4
2	0113	0.6	0708	-0.1	1427	1.9	2149	0.3
3	0155	0.6	0744	-0.1	1459	1.9	2215	0.3
4	0238	0.6	0819	-0.1	1531	1.9	2254	0.2
5	0317	0.6	0851	0.0	1602	1.9	2254	0.2
6	0356	0.6	0926	0.0	1634	1.9	-----	---
7	2358	0.2*	0438	0.7	1001	0.1	1702	1.8
8	0030	0.2	0524	0.7	1038	0.2	1734	1.7
9	0102	0.2	0614	0.7	1122	0.3	1808	1.7
10	0136	0.1	0713	0.8	1215	0.5	1842	1.5
11	0211	0.1	0824	0.9	1323	0.6	1923	1.4
12	0250	0.1	0934	1.1	1504	0.7	2015	1.2
13	0333	0.0	1040	1.4	1653	0.7	2117	1.0
14	0419	0.0	1139	1.6	1828	0.6	2230	0.8
15	0508	-0.1	1228	1.8	1937	0.5	-----	---
16	2342	0.8*	0557	-0.2	1316	2.0	2032	0.3
17	0048	0.7	0649	-0.2	1402	2.2	2117	0.2
18	0147	0.7	0738	-0.2	1446	2.3	2202	0.1
19	0240	0.8	0825	-0.2	1528	2.3	2242	0.0
20	0333	0.8	0912	-0.2	1609	2.2	2324	0.0
21	0426	0.9	1002	-0.1	1651	2.1	-----	---
22	0003	0.0	0521	0.9	1053	0.1	1733	1.9
23	0044	0.0	0619	1.0	1150	0.3	1815	1.7
24	0123	0.0	0726	1.1	1256	0.5	1857	1.5
25	0205	0.1	0835	1.2	1418	0.6	1943	1.2
26	0252	0.1	0951	1.4	1606	0.7	2035	1.0
27	0338	0.1	1103	1.5	1756	0.7	2141	0.8
28	0427	0.1	1159	1.7	1919	0.6	2257	0.7
29	0519	0.1	1245	1.7	2011	0.5	-----	---
30	0002	0.7	0604	0.1	1325	1.8	2053	0.5
31	0100	0.7	0649	0.1	1404	1.9	2121	0.4

* -- TIDE OCCURS ON PREVIOUS DATE.

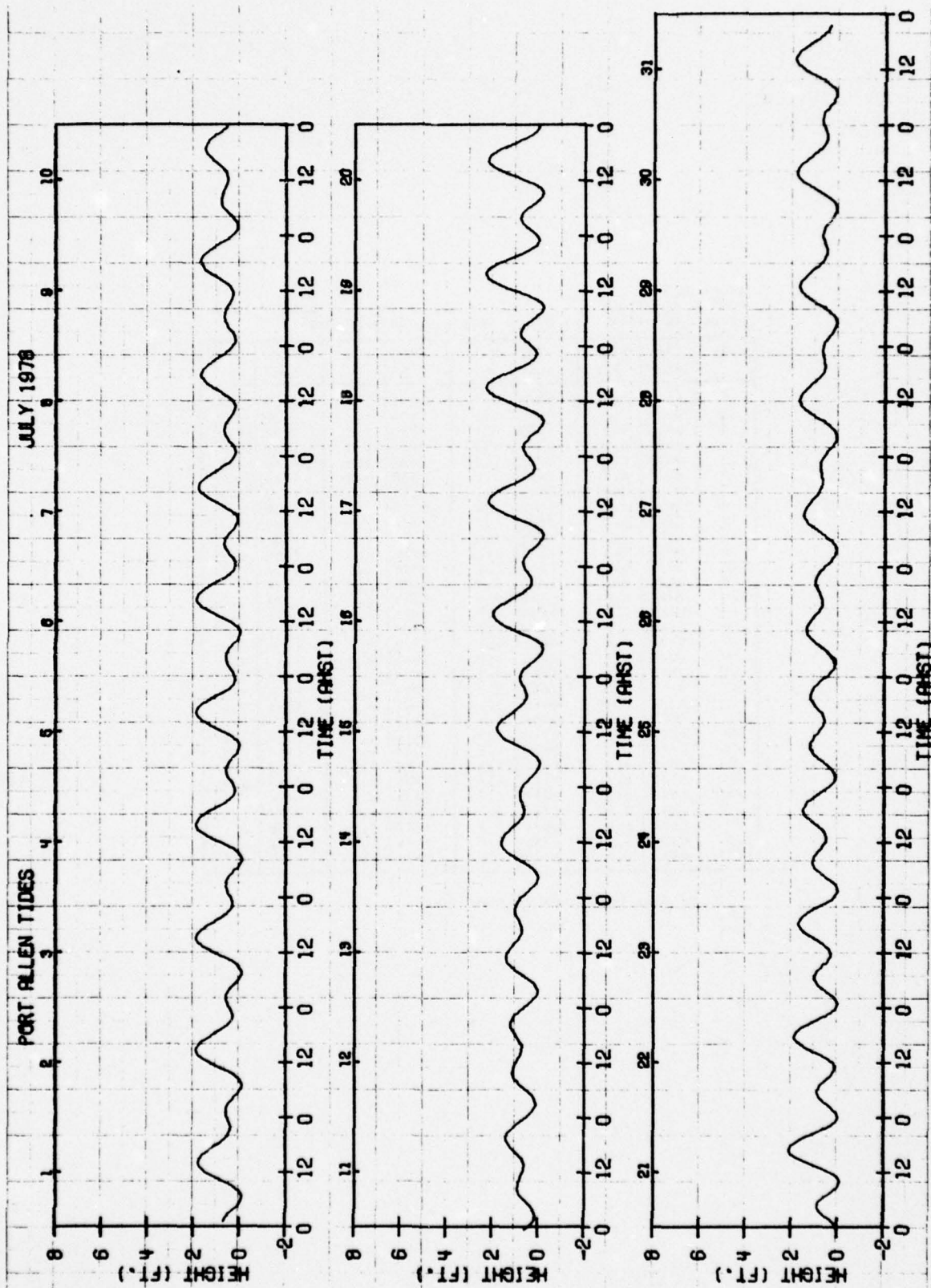


Figure 19. Tidal Graph for Port Allen, July 1978.

TABLE 36
PORT ALLEN TIDES
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE HAY AUGUST 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0144	0.7	0728	0.1	1434	1.9	2150	0.3
2	0225	0.8	0807	0.1	1506	1.9	2218	0.3
3	0302	0.8	0842	0.1	1535	1.9	2247	0.3
4	0338	0.9	0915	0.1	1604	1.9	2309	0.2
5	0414	0.9	0953	0.2	1632	1.8	----	----
6	2337	0.2*	0456	1.0	1032	0.3	1704	1.7
7	0006	0.2	0541	1.1	1117	0.4	1733	1.6
8	0033	0.2	0632	1.2	1209	0.6	1805	1.5
9	0109	0.2	0732	1.3	1320	0.6	1847	1.3
10	0147	0.2	0845	1.4	1458	0.7	1939	1.1
11	0238	0.2	1000	1.6	1650	0.7	2048	0.9
12	0334	0.1	1106	1.7	1826	0.6	2217	0.8
13	0436	0.1	1202	1.9	1924	0.5	----	----
14	2340	0.8*	0538	0.0	1255	2.0	2014	0.3
15	0047	0.8	0637	0.0	1341	2.2	2052	0.2
16	0143	0.9	0729	-0.1	1425	2.2	2131	0.1
17	0233	1.0	0822	-0.1	1505	2.2	2206	0.1
18	0322	1.1	0914	0.0	1547	2.1	2242	0.1
19	0409	1.3	1002	0.1	1626	1.9	2316	0.1
20	0459	1.3	1055	0.2	1704	1.7	----	----
21	2352	0.1*	0548	1.4	1149	0.4	1740	1.6
22	0027	0.1	0644	1.4	1252	0.6	1819	1.3
23	0104	0.2	0746	1.5	1410	0.6	1902	1.1
24	0149	0.3	0858	1.5	1554	0.7	1959	0.9
25	0236	0.3	1011	1.6	1743	0.6	2122	0.8
26	0340	0.3	1114	1.7	1850	0.6	2249	0.8
27	0443	0.3	1207	1.7	1932	0.5	----	----
28	2359	0.8*	0542	0.3	1252	1.8	2009	0.5
29	0052	0.9	0634	0.3	1327	1.8	2038	0.4
30	0133	1.0	0716	0.2	1404	1.8	2104	0.3
31	0209	1.0	0758	0.2	1434	1.8	2129	0.3

* -- TIDE OCCURS ON PREVIOUS DATE.

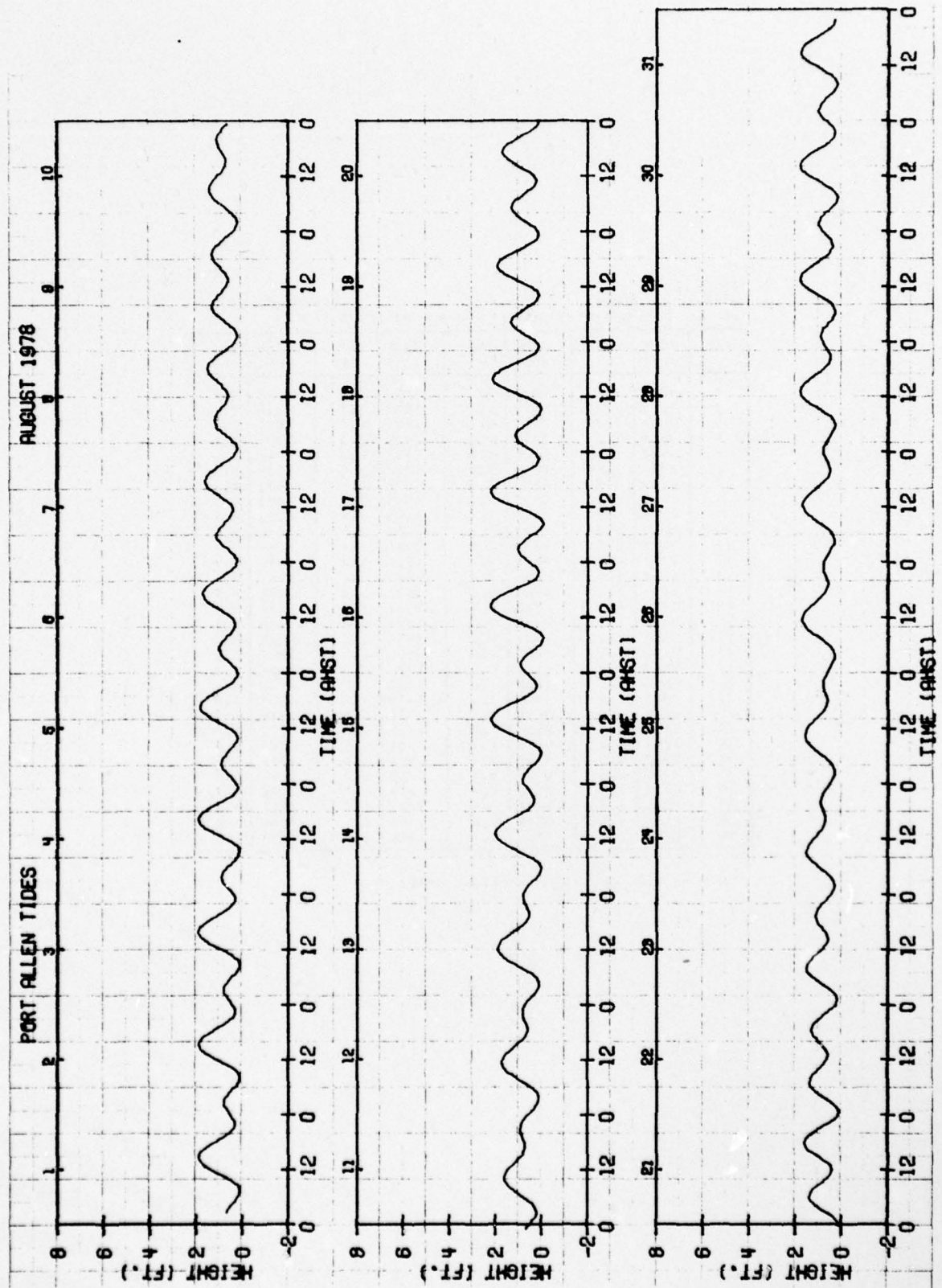


Figure 20. Tidal Graph for Port Allen, August 1978.

TABLE 37
PORT ALLEN TIDES
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY
SEPTEMBER 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0244	1.1	0833	0.2	1503	1.8	2151	0.3
2	0319	1.2	0912	0.2	1535	1.7	2216	0.2
3	0354	1.3	0951	0.3	1601	1.7	2241	0.2
4	0430	1.4	1034	0.4	1632	1.6	2306	0.2
5	0512	1.5	1120	0.5	1701	1.4	----	----
6	2337	0.2*	0558	1.6	1217	0.6	1739	1.3
7	0009	0.2	0653	1.6	1330	0.6	1821	1.1
8	0053	0.2	0802	1.7	1505	0.6	1923	0.9
9	0149	0.3	0915	1.7	1651	0.6	2053	0.8
10	0258	0.3	1029	1.8	1807	0.5	2232	0.8
11	0417	0.3	1133	1.9	1856	0.4	----	----
12	2351	0.9*	0530	0.2	1226	2.0	1940	0.3
13	0050	1.0	0635	0.2	1316	2.0	2017	0.2
14	0141	1.2	0732	0.1	1401	2.0	2051	0.1
15	0224	1.4	0823	0.1	1441	1.9	2124	0.1
16	0309	1.5	0915	0.2	1521	1.8	2156	0.1
17	0352	1.6	1004	0.2	1557	1.7	2225	0.1
18	0434	1.7	1055	0.3	1635	1.5	2257	0.1
19	0519	1.7	1150	0.5	1707	1.3	2326	0.2
20	0606	1.7	1250	0.6	1749	1.1	----	----
21	0001	0.3	0657	1.7	1406	0.6	1831	0.9
22	0040	0.4	0759	1.7	1534	0.6	1934	0.8
23	0132	0.4	0908	1.7	1705	0.6	2113	0.7
24	0244	0.5	1016	1.7	1804	0.6	2248	0.6
25	0404	0.5	1117	1.7	1845	0.5	----	----
26	2351	0.9*	0514	0.5	1203	1.7	1917	0.4
27	0039	1.0	0612	0.5	1245	1.7	1945	0.3
28	0116	1.2	0704	0.4	1324	1.7	2011	0.3
29	0150	1.3	0749	0.4	1356	1.7	2036	0.2
30	0225	1.4	0831	0.3	1428	1.7	2059	0.2

* -- TIDE OCCURS ON PREVIOUS DATE.

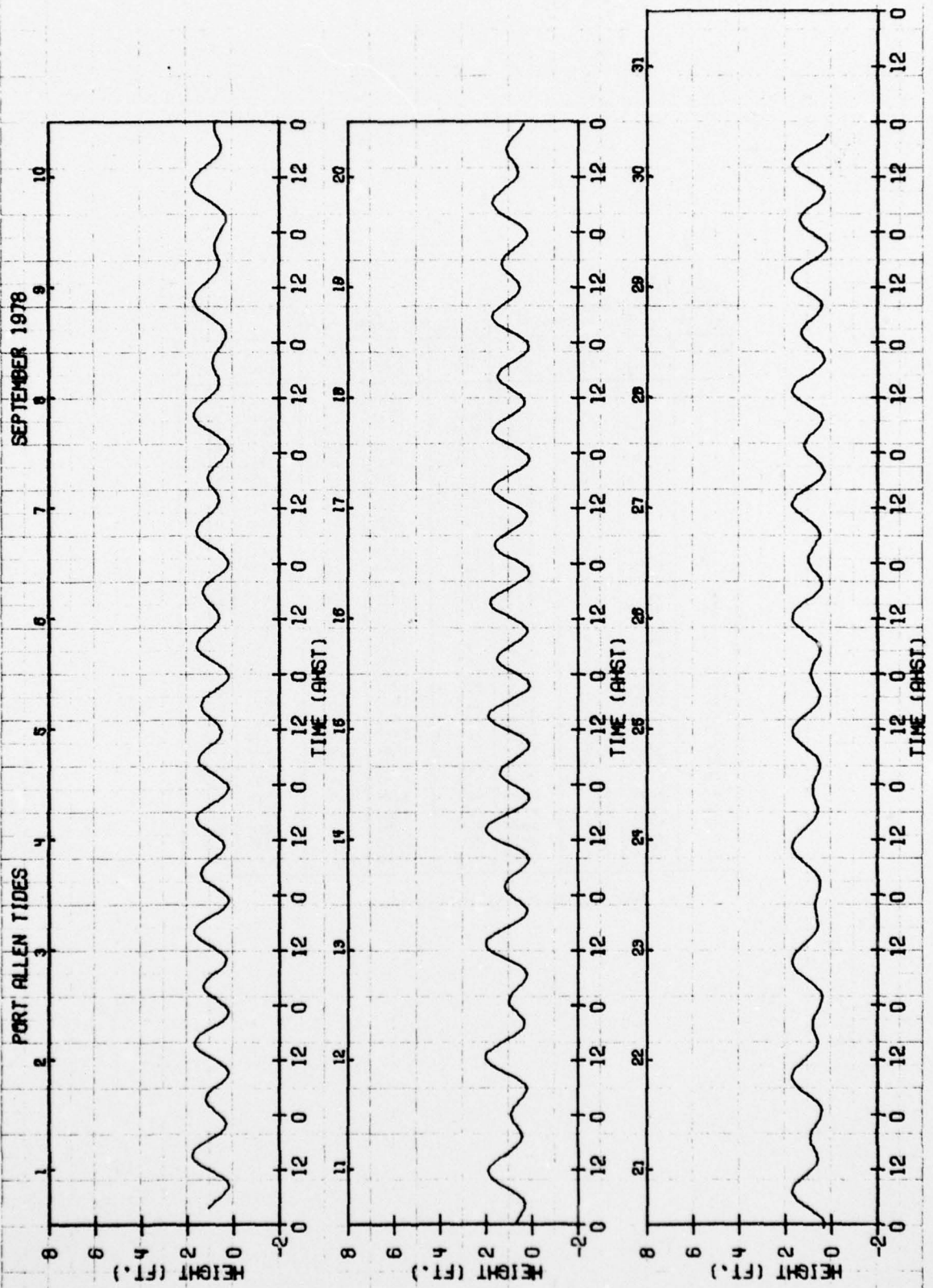


Figure 21. Tidal Graph for Port Allen, September 1978.

TABLE 38
PORT ALLEN TIDES
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY OCTOBER 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0257	1.6	0913	0.3	1459	1.6	2123	0.0
2	0333	1.7	0955	0.4	1531	1.4	2149	0.1
3	0408	1.7	1041	0.4	1603	1.3	2218	0.1
4	0447	1.8	1132	0.5	1638	1.2	2246	0.1
5	0535	1.8	1235	0.5	1717	1.0	2322	0.0
6	0627	1.8	1344	0.6	1812	0.9	----	----
7	0705	0.3	0730	1.8	1510	0.5	1928	0.6
8	0110	0.4	0839	1.8	1632	0.5	2114	0.7
9	0229	0.4	0952	1.8	1735	0.4	2250	0.9
10	0402	0.5	1058	1.8	1823	0.3	----	----
11	0559	1.0*	0524	0.5	1155	1.8	1901	0.0
12	0651	1.3	0637	0.4	1244	1.7	1937	0.1
13	0133	1.5	0737	0.3	1330	1.7	2009	0.0
14	0215	1.7	0831	0.3	1410	1.6	2039	0.0
15	0257	1.7	0922	0.3	1452	1.4	2108	0.0
16	0333	1.8	1010	0.3	1528	1.3	2137	0.1
17	0411	1.9	1100	0.4	1603	1.1	2205	0.1
18	0450	1.9	1152	0.4	1638	1.0	2233	0.0
19	0532	1.8	1248	0.5	1720	0.8	2305	0.3
20	0618	1.8	1350	0.5	1806	0.7	----	----
21	0740	0.4*	0709	1.7	1500	0.5	1923	0.7
22	0826	0.5	0804	1.7	1611	0.5	2059	0.7
23	0138	0.6	0906	1.6	1708	0.4	2233	0.8
24	0308	0.6	1008	1.6	1746	0.4	----	----
25	0335	0.9*	0437	0.6	1104	1.6	1821	0.3
26	0417	1.1	0549	0.6	1152	1.5	1850	0.2
27	0556	1.3	0649	0.6	1234	1.5	1916	0.0
28	0131	1.5	0739	0.5	1313	1.4	1942	0.1
29	0203	1.7	0827	0.4	1351	1.3	2009	0.0
30	0239	1.8	0914	0.4	1423	1.2	2035	0.0
31	0314	1.9	0959	0.3	1459	1.1	2104	0.0

* -- TIDE OCCURS ON PREVIOUS DATE.

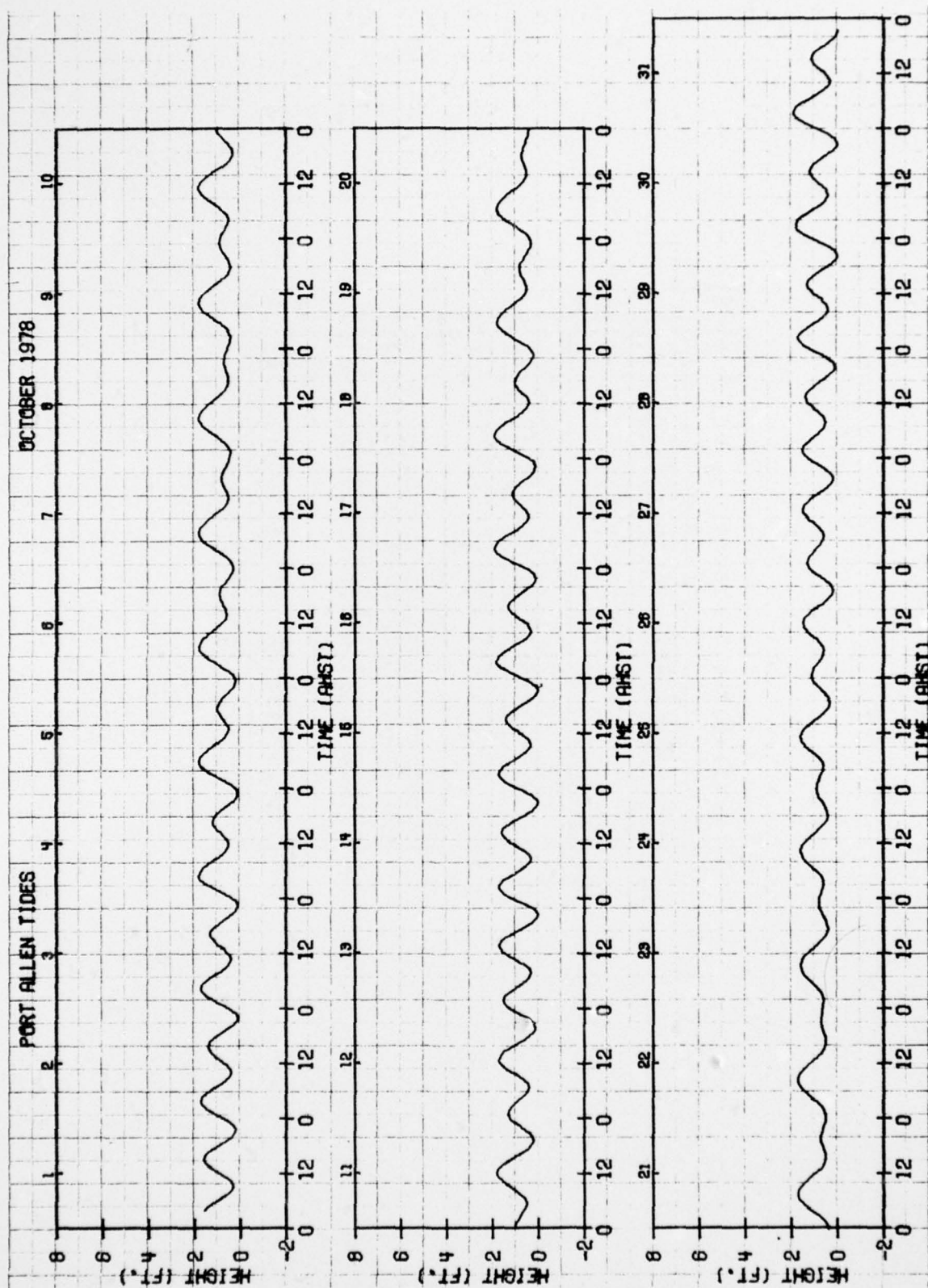


Figure 22. Tidal Graph for Port Allen, October 1978.

TABLE 39
PORT ALLEN TIDES
21 DEG 54 MIN N • 159 DEG 35 MIN W - HANAPEPE HAY NOVEMBER 1978

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0353	2.0	1048	0.3	1537	1.0	2136	0.0
2	0434	2.1	1140	0.3	1623	0.9	2212	0.0
3	0517	2.1	1239	0.3	1712	0.8	2253	0.1
4	0608	2.0	1344	0.3	1817	0.7	-----	---
5	2339	0.2*	0704	1.9	1454	0.3	1943	0.7
6	0044	0.4	0804	1.8	1600	0.2	2125	0.4
7	0210	0.5	0910	1.7	1654	0.2	2251	0.4
8	0353	0.6	1016	1.7	1741	0.1	-----	---
9	2354	1.2*	0526	0.6	1118	1.6	1820	0.0
10	0043	1.4	0642	0.5	1210	1.4	1855	0.0
11	0125	1.7	0745	0.5	1259	1.3	1927	-0.1
12	0206	1.8	0842	0.4	1345	1.2	1958	-0.1
13	0242	1.9	0931	0.3	1424	1.0	2027	-0.1
14	0317	2.0	1020	0.3	1502	0.9	2057	0.0
15	0353	2.0	1105	0.3	1537	0.8	2125	0.0
16	0428	2.0	1150	0.3	1616	0.7	2154	0.1
17	0505	1.9	1235	0.4	1659	0.7	2226	0.2
18	0544	1.9	1328	0.4	1750	0.6	2259	0.3
19	0625	1.8	1420	0.4	1857	0.6	-----	---
20	2340	0.4*	0710	1.7	1512	0.3	2027	0.6
21	0035	0.6	0800	1.6	1601	0.3	2157	0.8
22	0208	0.6	0855	1.5	1640	0.2	2303	0.9
23	0349	0.7	0951	1.4	1719	0.2	-----	---
24	2357	1.2*	0519	0.6	1046	1.3	1751	0.1
25	0031	1.4	0634	0.6	1138	1.2	1823	0.0
26	0106	1.6	0734	0.5	1227	1.1	1852	-0.1
27	0141	1.7	0827	0.4	1313	1.0	1926	-0.1
28	0220	1.9	0915	0.3	1355	0.9	1958	-0.2
29	0254	2.1	1004	0.2	1440	0.8	2033	-0.2
30	0337	2.2	1052	0.2	1525	0.8	2111	-0.2

* -- TIDE OCCURS ON PREVIOUS DATE.

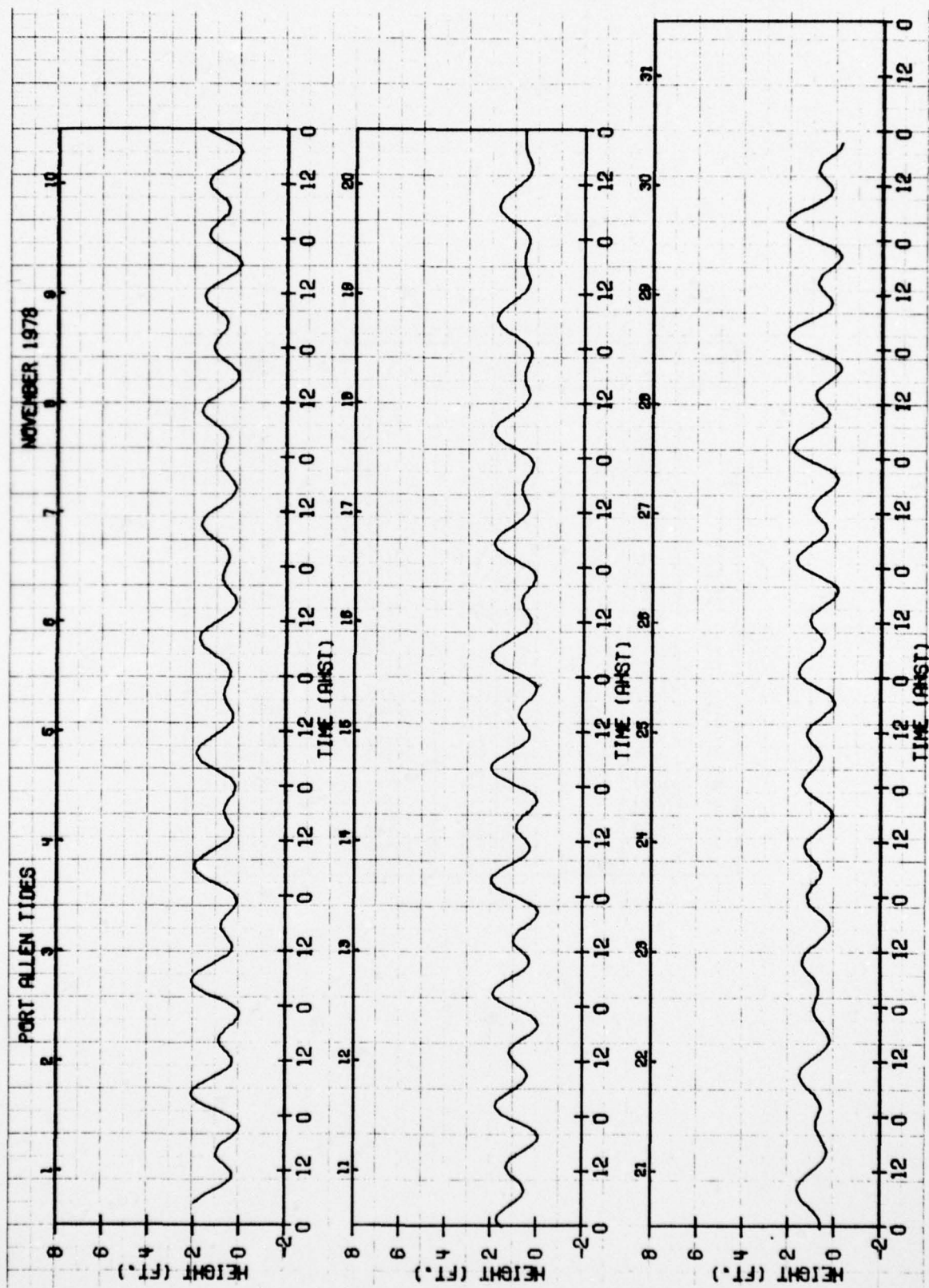


Figure 23. Tidal Graph for Port Allen, November 1978.

TABLE 40
PORT ALLEN TIDES
21 DEG 54 MIN N • 159 DEG 35 MIN W - HANAPEPE HAY DECEMBER 1976

DATE	TIME AMST	HGT FT	TIME AMST	HGT FT	TIME AMST	HGT FT	TIME AMST	HGT FT
1	0419	2.2	1142	0.2	1614	0.7	2152	-0.1
2	0503	2.2	1234	0.1	1711	0.7	2237	0.0
3	0550	2.1	1326	0.1	1817	0.6	2326	0.2
4	0640	1.9	1421	0.1	1939	0.7	----	---
5	0032	0.4	0732	1.7	1514	0.1	2110	0.8
6	0158	0.6	0829	1.6	1606	0.0	2233	1.0
7	0341	0.6	0933	1.4	1653	0.0	----	---
8	2337	1.3*	0526	0.6	1032	1.2	1735	-0.1
9	0031	1.5	0652	0.6	1135	1.1	1812	-0.1
10	0113	1.7	0758	0.5	1231	0.9	1849	-0.1
11	0151	1.8	0854	0.4	1319	0.8	1924	-0.1
12	0230	1.9	0942	0.3	1401	0.7	1956	-0.1
13	0304	2.0	1021	0.3	1443	0.7	2028	-0.1
14	0337	2.0	1100	0.2	1519	0.6	2056	-0.1
15	0410	2.0	1137	0.2	1558	0.6	2128	0.0
16	0447	1.9	1214	0.2	1642	0.6	2204	0.1
17	0516	1.9	1251	0.2	1727	0.6	2236	0.2
18	0549	1.8	1328	0.2	1824	0.6	2318	0.3
19	0625	1.7	1410	0.2	1931	0.7	----	---
20	0006	0.5	0703	1.6	1448	0.2	2051	0.8
21	0115	0.6	0749	1.4	1530	0.1	2207	0.9
22	0258	0.7	0837	1.2	1612	0.1	2306	1.2
23	0450	0.7	0940	1.1	1651	0.0	----	---
24	2355	1.4*	0620	0.6	1042	0.9	1730	-0.1
25	0040	1.7	0732	0.5	1145	0.8	1810	-0.2
26	0121	1.8	0825	0.4	1243	0.8	1852	-0.2
27	0201	2.0	0914	0.3	1336	0.7	1934	-0.3
28	0243	2.2	0959	0.1	1425	0.7	2016	-0.3
29	0323	2.2	1041	0.1	1516	0.7	2058	-0.3
30	0405	2.3	1126	0.0	1609	0.7	2145	-0.2
31	0447	2.2	1209	0.0	1705	0.7	2233	-0.1

* -- TIDE OCCURS ON PREVIOUS DATE.

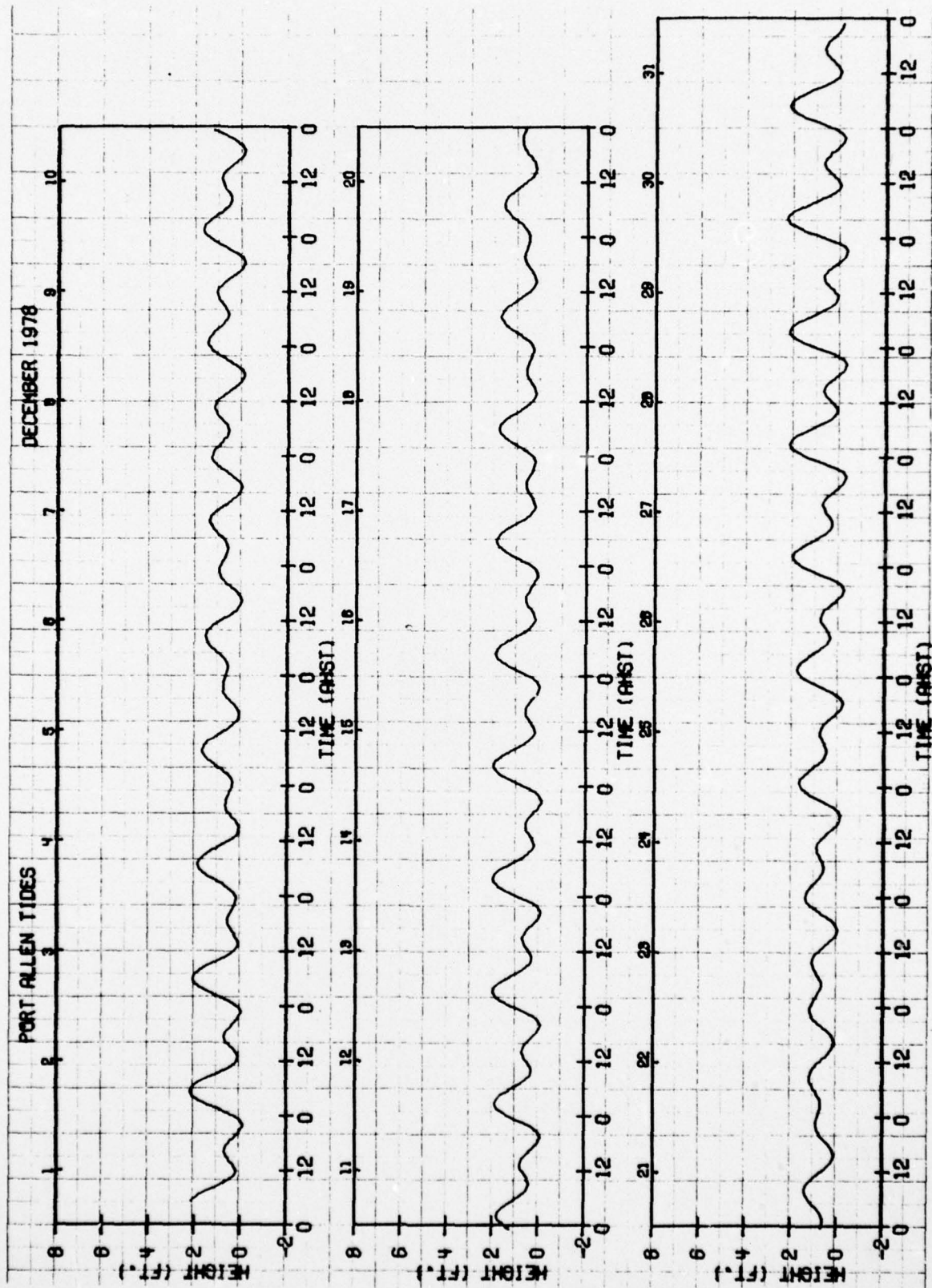


Figure 24. Tidal Graph for Port Allen, December 1978.

APPENDIX

EQUINOXES, SOLSTICES, AND LUNAR PHASES DURING 1978

The dates and times for Vernal and Autumnal Equinoxes and Summer and Winter Solstices during 1978 are listed in table 41. The 1978 dates and times for phases of the moon are given in table 42. Both tables have been calculated for Point Mugu and San Nicolas Island. Two hours must be subtracted for times in the Barking Sands area.

Table 41. Equinoxes and Solstices, 1978, Point Mugu and San Nicolas Island

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for Barking Sands area.

Vernal Equinox	20 March, 1534 PST	Beginning of Spring; day and night of equal length.
Summer Solstice	21 June, 1010 PST	Beginning of Summer; greatest duration of daylight.
Autumnal Equinox	23 September, 0126 PST	Beginning of Autumn; day and night of equal length.
Winter Solstice	21 December, 2121 PST	Beginning of Winter; greatest duration of darkness.

Table 42. Lunar Phases, 1978, Point Mugu and San Nicolas Island

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for times in the Barking Sands area.

Phase	January		February		March		April	
	Date	Time	Date	Time	Date	Time	Date	Time
Last Quarter	02	0407	---	---	02	0034	---	---
New Moon	08	2000	07	0654	08	1836	07	0715
First Quarter	15	1903	14	1411	16	1021	15	0556
Full Moon	23	2355	22	1626	24	0820	22	2011
Last Quarter	31	1551	---	---	31	0711	29	1302
Phase	May		June		July		August	
	Date	Time	Date	Time	Date	Time	Date	Time
New Moon	06	2047	05	1101	05	0150	03	1701
First Quarter	14	2339	13	1444	13	0249	11	1206
Full Moon	22	0517	20	1230	19	1905	18	0214
Last Quarter	28	1930	27	0344	26	1431	25	0418
Phase	September		October		November		December	
	Date	Time	Date	Time	Date	Time	Date	Time
New Moon	02	0809	01	2241	---	---	---	---
First Quarter	09	1920	09	0138	07	0818	06	1634
Full Moon	16	1101	15	2209	14	1200	14	0431
Last Quarter	23	1907	23	1634	22	1324	22	0941
New Moon	---	---	31	1206	30	0019	29	1136

Because the earth's period of revolution about the sun (365.24+ days) is not evenly divisible by the moon's period of revolution about the earth (27.32+ days), the dates and times of lunar phases, moonrise and moonset, and tidal data must be recomputed for each year. The following information, however, is based on geometrical relationships and holds true for all times:

1. The New Moon rises at sunrise, crosses the meridian at noon, and sets at sunset.
2. The First Quarter Moon rises at noon, crosses the meridian at sunset, and sets at midnight.
3. The Full Moon rises at sunset, crosses the meridian at midnight, and sets at sunrise.
4. The Last Quarter Moon rises at midnight, crosses the meridian at sunrise, and sets at noon.

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